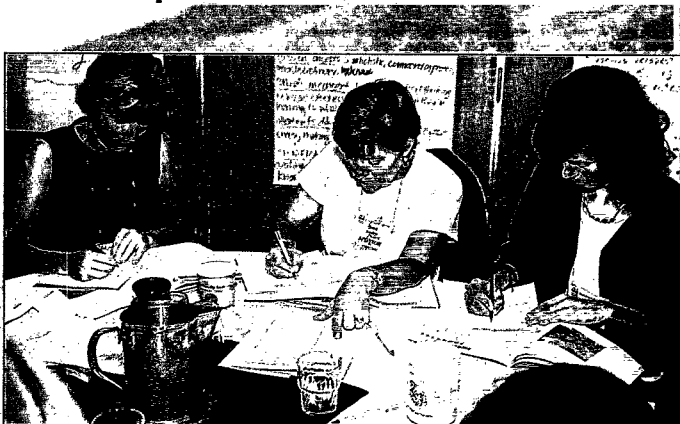# EEducator

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⚙ **Ideas for integrating your curriculum**

⚙ **Activities and resources**

⚙ **Exemplary programs and partnerships**

Special Issue:
Advancing Education Reform

EEducator

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Please let us know your thoughts about EEducator (and tell us about your experiences with environmental education) by mailing back the survey stapled into the center of this publication. We would greatly appreciate your input and suggestions to help us evaluate the usefulness of this and future publications!

EEducator

About NAAEE

The North American Association for Environmental Education is a network of professionals and students working in the field of environmental education throughout North America and in over 55 countries around the world. Since 1971, the Association has promoted environmental education and supported the work of environmental educators.

There are many environmental interest groups and many organizations dedicated to the improvement of education. NAAEE integrates these perspectives and takes a positive, cooperative, non-confrontational approach to promoting education about environmental issues.

The Association is made up of people who have thought seriously—over lifetimes—about how people become literate concerning environmental issues. NAAEE members believe education must go beyond consciousness-raising. It must prepare people to think together about the difficult decisions they have to make regarding environmental stewardship, and to work together to improve and solve environmental problems.

NAAEE recognizes the need for a coherent body of information about environmental issues. Its members also recognize that information and analysis are only part of an effective education program. To be truly effective, this body of knowledge must be integrated into all aspects of the curriculum and into all types of educating institutions for the widest array of audiences.

In order to translate theory into reality and provide tangible support for environmental education and environmental educators, NAAEE engages in a variety of programs and activities: an annual conference at varying North American sites; an active publications program; the VINE (Volunteer-led Investigations of Neighborhood Ecology) Network; the Environmental Issues Forums program; the Urban Leadership Collaboratives; the Affiliates Partnership; and the Environmental Education and Training Partnership (EETAP).

An introductory note…

Dear Colleague:

Welcome to the first issue of EEducator, *a magazine-style publication that explores education about the environment from new and stimulating perspectives.* EEducator *began as an idea first put forth by Judy Braus, then NAAEE Publications Committee Chair. It has reached completion as a project of NAAEE's Environmental Education and Training Partnership, which is funded by the U.S. Environmental Protection Agency Office of Environmental Education. NAAEE undertook this new publication with the hope that it would grow into a series focusing on key issues in environmental education, promoting thoughtful discussion on those issues, and highlighting important trends in education about the environment. After you read this first issue, I hope you'll agree with me that the editors and authors of* EEducator *have provided an auspicious and powerful first issue.*

This issue is devoted to the subject of education reform. Education reform is making fundamental changes in schooling today. Whether you work within K–12 schools, nonformal settings, or higher education, the education reform movement challenges us all to ponder questions related to what we teach, how we teach, how we prepare educators, and how we view the very nature of schooling. Because the education reform movement is so important and because environmental education as a field can offer a great deal to reform efforts and to successful schooling, we decided to focus on this topic for the inaugural issue of EEducator.

A quick glance at the table of contents shows the breadth of the articles addressing environmental education and education reform. A great deal of thought went into ensuring that the publication includes a variety of perspectives. Throughout the publication you'll also find several profiles highlighting some of the many local, state, and national programs that have been successful in their efforts to strengthen schools through environmental education.

I hope you enjoy this new publication and that it stimulates serious discussion and further enquiry. Since this is a prototype, we need your opinions to help us decide on frequency and content of future editions. Please complete the survey stapled into the center of this publication and return it to NAAEE.

Sincerely,

Edward J. McCrea
Executive Director, NAAEE

Clay County High School students installing the bridge they designed and built from scrap lumber.

Education and the Environment: Partners for Change

by Ruth Flanagan

To learn about local plants, biology students from Kentucky's Clay County High School decided to create their own nature trail on the school grounds. Before they could complete the trail, however, they had to build bridges over creeks. But before they could do that, they had to teach themselves how to build a bridge. They also had to test the soil around the creeks to make sure the foundation was safe, and develop a budget and marketing plan to raise the money for lumber. What started as a seemingly straightforward project evolved into a collaborative, long-term endeavor that drew together almost every school subject.

The project created new paths for one school. It also highlights new paths in education—trends that are dramatically shifting the way some schools work. Spurred by calls for reform at the national, state, and local levels, many schools are adopting more integrated approaches to teaching.

These changes were nudged partly by reports such as *A Nation at Risk*, issued in 1983 by the National Commission on Excellence in Education, which cited falling student test

scores as a sign that the public schools were faltering. But these changes have also come from a recognition that the world as a whole is changing at a dizzying pace. Given shifting economic, political, and technological realities, businesses are increasingly demanding employees with more flexible skills; people who not only possess knowledge, but who can nimbly apply it to complex problems.

While schools are changing in many different ways, a growing number are moving in the same basic direction as Clay County High: stressing the value of real-world experiences to boost student learning. Many are moving away from strictly textbook-driven, teacher-led instruction in favor of hands-on approaches with students more involved in their own learning. Some are replacing traditional, compartmentalized subjects with interdisciplinary curricula that more authentically connect fields of knowledge.

At the same time, a large number of schools are embracing the environment as a focus of study. According to Jane Wilson, executive director of the Kentucky Environmental Education Council, there's been a renaissance in environmental education since legislators passed the Kentucky

Education Reform Act (KERA) in 1990. This is probably no accident. As Clay County High School biology teacher Jocelyn Wolfe explains, "Environmental education is the best way to achieve KERA goals."

Though sometimes presented as an ancillary, stand-alone subject or a filler for a Friday afternoon, environmental education was originally conceived to mean something both far broader and more profound. It is not a subject but an approach that integrates many subjects—a kind of teaching that instills what Aldo Leopold termed "a consciousness of land," an understanding of the intricate, dynamic relationship between human beings and the environment, and a search for balance between the two. The National Environmental Education Advisory Council, which advises the U.S. Environmental Protection Agency (EPA) on implementing the National Environmental Education Act of 1990, defines environmental education as: "A learning process that increases people's knowledge about the environment and environmental challenges, and develops the necessary skills, expertise, and motivation to address these challenges with informed decisions and responsible actions."

Of course, it's one thing to argue that environmental education is good for ensuring that people make informed and responsible decisions that affect the environment. But is it good for education? If the reform initiatives described so far make pedagogical sense, the answer is "yes." "The most important reason is probably the simplest," says Dixie Reimer, a science teacher at Komachin Middle School in Olympia, Washington. "Children care deeply about the environment."

As a result, she says, important and engaging environmental themes can breathe life into academics, providing the relevance that motivates students to learn. Many educators believe that environmental studies hold particular promise for improving student achievement in science and math, a goal specifically mentioned in *Goals 2000*, the national agenda for education reform. Environmental topics also lend themselves to hands-on instruction, so they appeal to students' diverse learning styles.

Since environmental issues are by nature multifaceted and interdisciplinary, they provide rich opportunities for teaching across the curriculum. "You can't understand environmental problems unless you have a good sense of numbers, like parts per million and billions of people," says Gary Heath, Branch Chief for Arts and Sciences for the Maryland State Department of Education. "Nor can you understand them unless you understand the government, economics, and geography. How can you address an environmental problem unless you know about the people involved?" This encompassing quality can encourage a shift to interdisciplinary teaching, he argues, helping teachers to restructure their curricula and link disparate subjects in meaningful ways.

Environmental issues also provide ample opportunities for students to solve problems. This point touches on one of

Goals 2000: Educate America Act

On March 31, 1994, President Clinton signed the Goals 2000 Act—one of the most comprehensive school reform initiatives in history, thus far committing more than $1.7 billion to improving schools. Environmental educators have long promoted many of the strategies incorporated in these goals, including critical thinking skills, partnerships, citizenship skills, and interdisciplinary teaching. Here's a summary of the eight goals:

- **School Readiness:** Every child will start school ready to learn.

- **School Completion:** The high school graduation rate will increase to at least 90 percent.

- **Student Achievement and Citizenship:** All students will leave fourth, eighth, and twelfth grades having demonstrated competency over challenging subject matter including English, mathematics, science, foreign languages, civics and government, economics, art, history, and geography; and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our nation's modern economy.

- **Teacher Education and Professional Development:** The nation's teaching force will have access to programs for the continued improvement of their professional skills and the opportunity to acquire the knowledge and skills needed to instruct and prepare all American students for the next century.

- **Mathematics and Science:** U.S. students will be first in the world in science and mathematics achievement.

- **Adult Literacy and Lifelong Learning:** Every adult American will be literate, and will possess the knowledge and skills necessary to compete in a global economy and to exercise the rights and responsibilities of citizenship.

- **Safe, Disciplined, and Alcohol- and Drug-Free Schools:** Every school in the U.S. will be free of drugs, violence, and the unauthorized presence of firearms and alcohol and will offer a disciplined environment conducive to learning.

- **Parental Participation:** Every school will promote partnerships that will increase parental involvement and participation in promoting the social, emotional, and academic growth of children.

See the web site www.ed.gov/G2K/ for more information on Goals 2000.

the more controversial, and often misunderstood, facets of environmental education. While some environmental education programs have been criticized as politically biased, high quality programs never advocate a particular viewpoint. Rather, they encourage students to investigate issues from all sides, and then—and only then—make their own informed decisions, and take responsible and constructive action when appropriate. The process of investigation helps students develop the critical thinking skills that more and more schools are trying to cultivate.

This analytical aspect of environmental issues has helped earn them a place on a number of new standardized tests. For example, the Maryland State Department of Education has been administering new, comprehensive performance assessments to third, fifth, and eighth graders in the state's schools since the early 1990s. Like most new assessments, the Maryland tests aim to measure not only what students know, but how well they can apply what they know to solve real problems. And since "environmental issues lend themselves naturally to such analysis and synthesis, a number of the tasks and questions are set in an environmental context," Heath says. These tests in turn exert a powerful influence on teaching in the state.

No one can say whether schools around the country have consciously incorporated environmental education into their programs as a result of new tests. However, according to Heath, since the baseline assessment in 1993, Maryland's test scores have risen in most subjects, such as reading, social studies, and science. "Most schools' scores have gone up, and I think that's good for both education and the environment," he says.

Needless to say, schools approach environmental education in strikingly different ways. For instance, according to Gerald Lieberman, Program Director of the State Education and Environment Roundtable (see page 59), many exemplary schools initiated their programs as a natural outgrowth of their educational offerings, not as any conscious effort to "do environmental education." On the other hand, a small but significant number of schools developed their programs in close partnership with outside environmental educators. In some instances, environmental educators have even offered fundamental educational assistance, helping teachers to rework their curricula and instruction to meet reform goals.

Following is a glimpse at a few U.S. schools whose innovative programs demonstrate the possibilities. Contact information for each school is listed in the resources section at the end of the article.

Project-Based Environmental Education
Hollywood Elementary School, Hollywood, Maryland

The blacktop at Hollywood Elementary says a great deal about the school. Atop the playground is a vivid painting of the entire Chesapeake Bay watershed. Principal Kathleen Glaser says that the painting reflects Hollywood's commitment to the Bay. It also reflects a focus of education at Hollywood—helping students to recognize their connections to a larger community.

Unlike some schools, recent reforms from the district and state haven't dramatically altered Hollywood's programs. But the push for more relevant teaching has bolstered the school's longstanding philosophy: to nurture children's curiosity by helping them engage directly with the world. "I want fifth graders to leave our school deeply interested in life, asking good questions and having a good way of approaching their questions," says Glaser. To hone that sense of inquiry, teachers use projects as an integral part of instruction, with students working in small, multi-age groups to tackle both short- and long-term problems.

Perhaps not surprisingly, many of the projects at Hollywood involve the local environment. The students have long been involved in recycling, for example, and are now working to reclaim meadow on unused school lawns. And since 1988, students from teacher Betty Brady's fifth grade class have participated in an annual "wade-in" on the Patuxent River, which flows into the Chesapeake Bay. Former Senator Bernie Fowler started the wade-in—participants literally wade into the river until they can't see their feet—as a way of checking water clarity and raising awareness of the importance of the Bay.

By virtually any measure, Hollywood's programs represent high quality environmental education. They also "simply represent high quality education," says Heath. The Maryland State Department of Education has even showcased some of the teaching methods being explored at Hollywood as models for other schools.

A project led by science teacher Julie Tracy shows how such teaching can work. In one sense, the aim of the project was to attract more wildlife to a storm-water management pond on school grounds. At the same time, it offered rigorous and rewarding learning opportunities across the curriculum.

Hollywood Elementary students participated in the 1988 "wade-in" on the Patuxent River.

HOLLYWOOD ELEMENTARY SCHOOL

At the start of the project, for instance, teams of third and fifth graders studied as artists, gathering at the pond and carefully drawing what they observed. Later, they became field biologists, systematically surveying the pond and discussing how to make it more amenable to wildlife. After deciding to plant wetland species, the students chose appropriate plants in an ecology lesson and calculated how many they would need using charts and algebra, advanced skills for these age groups. They also came up with a budget, justified their choices in writing, and wrote to a wetland expert for suggestions. Ultimately they wrote their own grant proposal for plants and materials. And now, two years after their first planting, the students are proudly monitoring the pond, which, as a result of their labors, has become home to muskrats, snakes, frogs, dragonflies, and many other species.

For this and other environmental projects at Hollywood, the staff calls on outside environmental educators for resources, training, support, and inspiration. "I don't think we could have done anywhere near as meaningful a job without environmental educators working with our teachers," Glaser says.

Partnerships and New Perspectives Meet Needs of Diverse Student Body
Gove Elementary School, Belle Glade, Florida

In a county where 67 languages are spoken, Gove Elementary seems, in some respects, a different world. About 70 percent of the children speak limited English, with Spanish the most common native language. A large number come from migrant farm-worker families. Fourteen percent of the students receive services from the Exceptional Student Education Program, which helps students with challenges ranging from specific learning disabilities to profound mental disabilities.

At Gove, both state-mandated reforms and environmental education have had a transforming effect. In 1995, Florida's Commissioner of Education placed Gove as one of 13 "critical schools" in the state whose performance on standardized tests fell far below the national average in reading and math. The school was put on notice to bring up its scores as part of a comprehensive school improvement plan.

Gove's principal, Margarita Pinkos, swiftly made dramatic changes in the way teachers approach their work. At a two-week, voluntary summer retreat last year, she encouraged teachers to collaborate much more, both within and across grade groups. These new perspectives led to a major shift to an integrated curriculum organized around four nine-week themes, and tied to county benchmarks for education.

Of course, actually implementing such a fundamental change posed a serious challenge. Most teachers had little or no experience developing integrated, interdisciplinary

Gove students at Pine Jog Environmental Education Center.

units. Five teachers on staff, however, gained this knowledge thanks in large measure to a "Model School" program offered by the Pine Jog Environmental Education Center in West Palm Beach, Florida. Among other objectives, Pine Jog's Model School program helps teachers use environmental education to meet their reform goals. For example, it enabled Gove teachers to attend "Dimensions of Learning" workshops, where they learned general strategies for improving their teaching. The Mid-Continent Regional Educational Laboratory in Aurora, Colorado—one of the nation's ten regional educational laboratories (see page 47)—developed "Dimensions of Learning" to introduce an approach to learning that cultivates critical thinking skills. The Pine Jog staff also worked closely with Gove teachers to design new curricula tailored specifically to their diverse student body and their specific improvement plan.

"Pine Jog taught us a lot about how to create an integrated thematic unit, what a concept map is (see page 8), how you look at benchmarks and tie them in, and how you find meaningful, relevant activities for different learning styles," says Denise Beaulieu, a speech language pathologist. "Pine Jog was really useful because these strategies are at the cutting edge of school reform."

Though many of Gove's teachers have always taught about the environment, the Pine Jog experience cemented their decision to make the environment the focus of one of their school-wide, nine-week units. According to Beaulieu and Gayle Zavala, also a speech language pathologist, the unit offered appropriate learning experiences for all of the students. A group of mentally disabled kindergarten through second grade students cultivated their own garden and ate what they grew. A group of fourth graders studied energy through lessons that pulled together several disciplines and incorporated developmentally appropriate literature. To reinforce the new concepts, they read Gary Paulsen's *The Tortilla Factory*, in which the lead character—a Mexican farm worker to whom many of the students easily relate—follows the different ways energy is used as corn moves from field to factory, store, and table.

INTRODUCTION
We Live on the Planet EARTH

which provides our → **Basic Needs**

which includes the → **North American Continent**

Basic Needs —are→ **Clean Air**

Basic Needs —are→ **Clean Water**

Basic Needs → **Food**

Basic Needs —are→ **Shelter**

Clean Air / Clean Water / Food —is needed by→ **Animals**

Shelter —needed by→ **Animals**

Food —needed by→ **People**

North American Continent —is where we find→ **South Florida Our Home**

People —live in→ **Hotels, Apartments, House, Condos, Trailers, Boats, Chickees, Tents**

South Florida Our Home —is where we→ **Care for our home Value & respect diversity of life that share our home planet Earth**

Animals —live in→ **Land Homes**

Animals —live in→ **Water Homes**

Land Homes —can be→ **Trees Nests**

Land Homes —can be→ **Under ground burrows**

Land Homes —can be→ **Above ground dens**

Water Homes —can be in or near→ **FRESH WATER canals, ponds, lakes. gator holes**

Water Homes —can be in or near→ **SALT WATER oceans, reefs**

Concept map created by Gove students.

The unit culminated with an exciting flourish: the school held an environmental fair in which students in each grade designed activities for the rest of the school to enjoy. At the fourth grade station, students ate nachos baked in a handmade solar oven. A few yards away, second graders fished simulated pollutants, such as oil and miniature tires, out of a model of Lake Okeechobee. Susan Toth, director of education at Pine Jog Environmental Education Center, said of the fifth graders, who created skits and visual aids to teach younger students about cycles: "I was blown away. The fifth graders took their job of teaching the younger kids so seriously. It was incredible to watch." Zavala and Beaulieu say the unit was a success—so successful that the school plans to repeat and improve it this year.

Naturally, the staff hopes that its work will pay off in student achievement. "We're waiting to see the benefits of our labor," says Zavala, "but we like what we've accomplished so far." And the signs are encouraging; based on improved standardized test scores, the school was excised from the Commissioner's critical list.

Starting from Scratch
Komachin Middle School, Lacey, Washington

For people struggling to reform and improve their schools, Komachin's beginnings may sound like a dream come true. Instead of tinkering with an existing, traditional school, educators built Komachin from scratch in 1990. "We started by envisioning what we wanted," says teacher Dixie Reimer. "We visited schools; we thought; we read; we asked, 'What do kids need? How do they learn best?'....Then we collectively put all that together and designed a school."

Their vision of a sound education for the future has a familiar ring. According to Reimer, they felt that students would need, among other things, "problem solving skills, communication skills, and technological skills for the new world." And to nurture their learning, they'd need hands-on, cooperative experiences and the chance to develop close, longstanding relationships with teachers.

Komachin realized these goals, in part, by adopting a block schedule, with most classes at least 90 minutes long to allow more time for projects, such as laboratory work and trips. They also adopted an integrated, interdisciplinary curriculum organized around broad themes. Each class subject aims to reinforce the theme from a different perspective, and the semester concludes with a culminating activity to help students synthesize what they've learned.

One of the school's integrated activities gives a flavor for its approach. Teams of students are asked to envision and create their own "sustainable community" set along one of three local ecosystems: the ocean, a river, or a forest. At the semester's end, they present and "sell" their ideal community to the rest of the school, often using dioramas and posters.

The teachers don't prescribe any single approach to the

Komachin students test water quality on the Deschutes River.

task, but rather give students tools to identify and articulate their own visions. In science, they visit and investigate the ocean, rivers, and forests. In math, they calculate the waste that their own family produces to get a sense of the challenges involved in sustainable design. In language arts, they write poetry that could help them express and promote the values of their community.

Over the past few years, the school has bolstered its environmental instruction further with help from "Environmental Education Model Schools" and "Creating Model Links," environmental education programs coordinated by Washington's Office of the Superintendent of Public Instruction. These programs provided money for field trips and time for planning. The teachers used their time to infuse the environment more fully into the curriculum while simultaneously enhancing their academic offerings. And now Komachin hopes to use a district grant to launch a ninth grade program on global rivers, in which students from various schools would use the Internet to share ideas and data, and gain skills in science, math and technology. "We're trying really hard to do this program," says Reimer. "This is one way to prepare them for the rigors of high school, and to keep them in love and involved with science."

A School That's in It Together
Clay County High School, Manchester, Kentucky

The teachers at Clay County High School know well what it means to keep students "in love" academically. And for the past several years, they've seen their own labors of love take hold in the school. Indeed, one could view their efforts as an object lesson: a demonstration of the power of a dedicated community—and well-timed reform—to turn a flagging school around.

Like Gove Elementary, Clay County High faces some formidable challenges. Set in a coal-mining and farming region of eastern Kentucky, Clay County is the seventh poorest county in the nation. About 80 percent of the students receive a subsidized lunch.

The 1990 Kentucky Education Reform Act (KERA) was, in some respects, a godsend for the school. Arguably the most comprehensive reform package in the country, KERA provided more equitable funding for schools across Kentucky. Interestingly, the Act also provided an occasion for some of the school's teachers to try out ideas that had been simmering for years. According to biology teacher Jocelyn Wolfe, she and her colleagues had long dreamed of creating an outdoor classroom where students could learn by doing. Such a classroom would lend itself to skills-oriented interdisciplinary, collaborative instruction—approaches that KERA requires. "Before KERA we might have met some resistance from our administration," she explains. "People are so afraid of liability, they're hesitant to try new things."

With the license to experiment and some staff development from local environmental educators, Clay County's staff and students created a full-fledged Environmental Research Center. The Center encompasses traditional elements of an outdoor classroom, such as a nature trail and wildlife habitat. A Cherokee village, a pioneer log cabin, and an herb garden greenhouse also bring traditional Appalachian culture to life. Restored wetlands and a greenhouse focusing on native plant preservation offer many possibilities for research and field study.

The Center also provides rich opportunities to achieve KERA goals. For example, teachers of anthropology, art, history, and economics all use the Cherokee Village to teach collaborative lessons about Native Americans. And since approximately 1,800 students visit the outdoor classroom each year, the students have ample opportunity for service learning, which is also encouraged by KERA. The high school students teach younger children such skills as Indian gardening, cooking, and basket weaving. They write brochures, develop lessons, and offer guided tours along the nature trail. If all goes well, a class of juniors and seniors will soon run the trail like a business, with a board of directors in charge of public relations.

The Environmental Research Center has not only helped students learn, says Wolfe, it has given them pride in themselves and their school. "Before the outdoor classroom, I used to hear kids refer to school as a prison," she says. "I don't hear that anymore. The kids are so proud it's just unreal. The whole school feels like we're in this humongous project together."

Limited Preparation May Be Keeping Numbers Low

In strikingly different ways, Hollywood and Gove Elementary Schools, Komachin Middle School, and Clay County High School all exemplify how the environment can advance education reform. Yet the total number of schools in the nation that have woven the environment deeply and meaningfully into their teaching remains relatively small. The reasons, of course, are numerous and complex. But one of the most fundamental is easy to pinpoint: limited teacher training in both the preservice and inservice arenas.

Despite society's professed interest in the environment, the vast majority of teachers emerge from schools of education, where they get their preservice training, without any formal instruction in environmental education. As Rosalyn McKeown-Ice of the University of Tennessee points out in a recent report, only nine percent of teacher colleges require elementary education majors to take a practicum in environmental education; only seven percent require one for high school teachers. (Her article on page 34 explores this issue further.)

There is also room for improvement in *how* environmental education is presented to future teachers in schools of education, according to Nancy Gabriel in a recent report from Second Nature, an environmental education organization in Cambridge, Massachusetts. Her report shows that while environmental education is inherently interdisciplinary, it is usually introduced as a discrete "special topic" in science curricula. The opportunity exists for schools of

Why is Environmental Education Ideal for Improving Student Learning?	Teaching about the environment and environmental issues can be used to:
	• Develop inquiry, problem-solving, and critical thinking skills.
	• Develop team-building and group decision-making skills.
	• Promote hands-on learning.
	• Tie learning to the community with a real-world application.
	• Strengthen learning in core subjects (science, math, geography, language arts, civics, etc.).
	• Promote interdisciplinary learning.
	• Promote learning about technology and technological advances.

education to introduce a more practical model for integrating the environment throughout the curriculum.

Since environmental education has not yet won a permanent place in the preservice system, those teachers who do receive environmental education training usually do so from nonformal providers such as natural resource agencies, nature centers, botanical gardens, and zoos, as well as national programs like Project WILD, Project Learning Tree, and Project WET. These types of nonformal educational entities operate separately from, but certainly not independent of, the formal school system. They offer a critical service to educators in the form of inservice training. (See page 40 for more on inservice training.)

For instance, the highly successful Project Learning Tree, an educational program of the American Forest Foundation, held training workshops for 30,000 educators and 2,500 facilitators throughout the United States in 1998 alone. Certainly these large and popular programs, with their expansive networks of facilitators and trained educators, are making a dent in bringing environmental education into the school system. But still, with 3,126,000 teachers in nearly 115,000 schools across the United States, there is a great opportunity here for more inservice training that can reach increased numbers of educators. Fortunately, some of the larger inservice programs— Projects WILD, WET, and Learning Tree included—are being expanded under the Environmental Education and Training Partnership (EETAP). Funded by U.S. EPA, EETAP is a $9 million, five-year joint venture between EPA, the North American Association for Environmental Education (NAAEE), and ten other universities and organizations to deliver environmental education training and related support services to education professionals.

Kimberly Wade, in a 1996 article published in *The Journal of Environmental Education*, cautions that in some cases there are drawbacks to prepackaged curricula—the most common form of inservice training for teachers. In Wade's analysis, some of these curricula tend to focus on what to teach but do not as often address the more difficult issue of how to teach. What's more, because these programs are ready-made, they tend to assume that all teachers, students and communities can be treated alike. In Wade's words, "The shortcoming of today's dominant approach to staff development is that teachers are spoon-fed prepackaged activities and treated as curricular consumers rather than professional educators....The result is that environmental education is in danger of becoming less and less relevant to the nation's schools and school support systems."

> "Before the outdoor classroom, I used to hear kids refer to school as a prison," she says. "I don't hear that anymore. The kids are so proud it's just unreal. The whole school feels like we are in this humongous project together."

A Changing Role for Nonformal Education Programs

The same political and economic pressures that are squeezing schools today are also affecting nonformal environmental education programs. In this era of accountability (it's often "raise test scores or else"), many schools view programs from agencies, zoos, and nature centers as a luxury they can ill afford. "It's really important to attend to the pressure to perform that our schools are under," says Heath of the Maryland State Department of Education. "All schools would like to, say, get kids outside on a field trip. But they've got to get more out of that field trip than they used to get."

Fortunately, many nonformal environmental educators are increasingly aware of their changing role, and are finding creative ways to address schools' needs. Florida's Pine Jog Environmental Education Center, for example, has evolved from a traditional nature center into a sophisticated catalyst for systemic school change. In that capacity, Pine Jog has learned to listen to teachers, and do its "homework" to meet their true needs. "We've heard loud and clear that teachers are overburdened. We can't expect them to add one more thing to their curriculum plates," explains Susan Toth, director of education at Pine Jog. "But we can use environmental education to restructure what's already on their plates and make it more manageable."

In a similar vein, the Washington Department of Fish and Wildlife has collaborated with the state's Model Links Program to retool its curriculum packages. The aim is to create programs that respond more effectively to schools' learning objectives.

Some environmental educators see such efforts as part of a larger trend: a renewed focus on the "education" in environmental education. But what does this really mean? As Tom Marcinkowski, chair of the Graduate Program in Environmental Education at the Florida Institute of Technology, points out, infusing environmental education more fully into schools demands a better understanding of all the disparate forces that influence them, from local school boards to state governments to national education organizations and even textbook publishers.

NAAEE is one of many organizations involved in this broad mission. Among other projects, NAAEE is working to create voluntary guidelines for excellence in environmental education in the areas of materials, what learners should know and be able to do, and environmental educator preparation. The guidelines effort is parallel to the standards established for math, science, and other subject areas. Critics
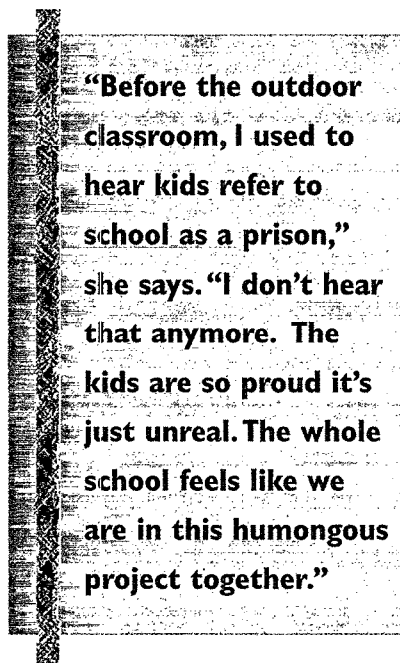
fear that the guidelines are unnecessary and potentially damaging since creating separate environmental education guidelines might widen the conceptual gap between environmental education and the core disciplines. Proponents feel that guidelines will offer quality control for educators, ensuring that the environmental education students receive is effective, comprehensive, and unbiased.

U.S. EPA is also placing more emphasis on the "education" component of environmental education. In 1997, EPA added a new priority to its list of projects that will be considered for funding under the Environmental Education Grant Program. The addition is for those projects that "utilize environmental education as a catalyst to advance state, local, or tribal education reform and improvement goals." In addition, EPA has made tying environmental education to education reform a central theme of the Environmental Education and Training Partnership.

Clearly, this is a dynamic, if tumultuous, time for education and the environment alike. The "right" path to take remains to be seen. But as today's students move into adulthood, that path may become clearer. After all, it is those students' knowledge, attitudes, and actions as citizens that will tell us, in the end, whether we have succeeded.

Ruth Flanagan is a freelance writer living in Madison, Wisconsin.

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Chard, Sylvia. *The Project Approach: A Practical Guide for Teachers.* Division of Technology in Education, Faculty of Education, 3-102, Education Dept., North University of Alberta, Edmonton, Alberta, CANADA T6G 2G5 (403-492-3667)

Gabriel, Nancy. *Teach our Teachers Well: Strategies to Integrate Environmental Education into Teacher Education Programs.* Cambridge, MA: Second Nature, 1996.

Gardner, Howard. *Frames of Mind: The Theory of Multiple Intelligences.* New York: HarperCollins Publishers, 1983.

Hungerford, H. A. *Investigating and Evaluating Environmental Issues and Actions:* Skill Development Program. Champaign, IL: Stipes Publishing Co., 1996.

Orr, David. *Ecological Literacy: Education and the Transition to a Postmodern World.* Albany: State University of New York Press, 1992.

PROGRAMS CITED

Hollywood Elementary School
44345 Joy Chapel Road
Hollywood, MD 20636
(301) 373-4350
**www.smeps.k12.md.us/
holhome.htm**

Gove Elementary School
900 SE Avenue G
Belle Glade, FL 33430
(561) 993-4042

Komachin Middle School
3650 College Street SE
Lacey, WA 98503
(360) 438-8800
**www.hellgate.k12.mt.us/tp/
schools/koman.htm**

Clay County High School
Route 7, Box 44
Manchester, KY 40962
(606) 598-3737

Pine Jog Environmental
    Education Center
College of Education/Florida
    Atlantic University
6301 Summit Boulevard
West Palm Beach, FL 33415
(561) 686-6600

Model Links Program
8323 28th Avenue NW
Seattle, WA 98117
(206) 706-6051
**http://cisl.ospi.wednet.edu/CISL/
ENVED/MDLINKS.html**

Project-Based Learning

(PBL) is a structure that transforms teaching from "teachers telling" to "students doing." The Autodesk Foundation, one of the leading proponents and supporters of PBL, defines it as:

• Engaging learning experiences that involve students in complex, real-world projects through which they develop and apply skills and knowledge;

• A strategy that recognizes that significant learning taps students' inherent drive to learn, capability to do important work, and need to be taken seriously;

• Learning in which curricular outcomes can be identified up-front, but in which the outcomes of the student's learning process are neither predetermined nor fully predictable;

• Learning that requires students to draw from many information sources and disciplines in order to solve problems;

Finding Your Way on the Prairie

Teacher Jane Weaver was scared when she first took her fifth grade students outside to explore the prairie grassland near Gililland Elementary School in Blue Mound, Texas. She worried about losing control in the vast space. She worried about kids wandering off, and spent much of her time counting to make sure everyone was there. Mostly, though, she worried about getting lost.

In fact, it was outside on the prairie that Weaver found her way as a teacher. Those early outdoor lessons have evolved into The Prairie Project. The project is an exemplar of project-based learning (see box), an approach that engages students in complex, real-world projects through which they develop and apply skills and knowledge. Weaver no longer uses textbooks. Although she has received some static about it, she says, "I don't know how I could go back to teaching any other way."

The Prairie Project curriculum is almost entirely integrated, incorporating science, math, history, social studies, language arts, and more. A majority of the learning goes on outdoors through hands-on activities. According to Weaver, "The outdoors is an equalizer. With project-based learning in the outdoors, the 'A' student and the non-reader work side-by-side, each bringing something special to the project. When you let students take some responsibility for their own education, they will change."

Over the project's eight-year history, Weaver's students have helped restore the prairie, an ecologically important remnant of an ecosystem that once covered 12 million acres. They've studied the bioregion's social and ecological history, and have published literary research on the legends of prairie flowers. To improve access, the fifth graders designed and built a bridge, and they added a greenhouse in which to raise native prairie plants and collect seeds. This year, the students will conduct their seventh annual tree planting. They've also planted an herb garden on their campus, and are talking about publishing a community cookbook with recipes using the vegetables and herbs they grow.

Picking up on traditional arts of the prairie, each of Weaver's classes creates a quilt to celebrate the 100th day of the semester. Each student makes two squares for the quilt, sometimes based on a theme, sometimes entirely their own design. The quilts are hung with great care around the school, and former quilters—some now graduating from high school—regularly return to see them and share them with others. When asked what they possibly could learn by quilting in class, students explained, "We learned how to make even squares and to measure perimeters. And we learned how to iron."

Weaver's students do well on standardized tests, but she is still asked to prove that her methods work. She fears that some people want to change education by doing the same old thing a little bit better. Instead, she feels relevance is key. She says, "Learning out of context is a waste. We don't have time for children to ask 'Why am I doing this?'" That her methods are effective is clear to several middle school teachers who have transferred into the district so they can teach former Gililland students, noting that "they're the only ones who still like science in the eighth grade."

According to Weaver, "The whole town loves The Prairie Project. It changes people. It's changed the town. They literally had nothing to be proud of, and now they're so proud." Even the local McDonald's is involved. Along with other teachers and parents from the school, Weaver cleans tables at the restaurant. She does it once a month, but she's not supplementing her income. In exchange for this good spirited volunteer labor, McDonald's donates 10 percent of the day's income to the project.

Imagine how proud the community felt as Gililland's fifth grade students traveled to Fort Worth to sing for former first lady Lady Bird Johnson. Or how community members must have beamed when renowned scientist and educator Jane Goodall visited the school and commented, "What the children have done here is unbelievable. I've searched the whole world for a place like this."

• Experiences through which students learn to manage and allocate resources such as time and materials.

According to the Autodesk Foundation, which sponsors a PBL Network as well as an annual PBL conference called "Kids Who Know and Do," students need to and want to know they can solve real-world problems that are open-ended, complex, and interesting. Project-based learning is student-driven; with PBL, students develop and hone academic, social, and life skills through school work that has a context meaningful to them. Learning is connected, or reconnected, to the real world so that it is meaningful and memorable.

For more on project-based learning, contact the Autodesk Foundation at its web site, www.autodesk.com/foundation/pbl, or at 111 McInnish Parkway, San Rafael, CA 94903, (415) 507-5670.

RECOMMENDED READING:
The California Freshwater Shrimp Project: An Example of Environmental Project-Based Learning by Laurette Rogers Berkeley: Heyday Books, 1996.

For more information on the Prairie Project, contact Jane Weaver, Gililland Elementary School, 701 Waggoman, Fort Worth, TX 76131, (817) 232-0331. Two web sites also offer program descriptions:
www.tpwd.state.tx.us/expltx
and www.seedsource.com

A Primer on Education Reform

by
Art
Sussman

Since the publication in 1983 of a report called *A Nation at Risk*, education reform has occupied a prominent place in national dialogue. Presidents and governors endorse national education goals and promote programs to achieve those goals. School districts and teachers engage in a wide array of efforts to improve how students learn in America.

From one point of view, education reform is very complicated, featuring lots of different initiatives, programs, and players. From another point of view, it is not so complicated. Virtually all efforts to improve education focus on one or more of four broad areas, summarized below and detailed in the following primer:

Curriculum the knowledge and skills we want students to learn and be able to do.

Instruction the ways we expect teachers to teach and students to learn.

Assessment how we know if students have learned what we want them to learn.

Schools how schools are organized at the local level.

Comparing the goals of education reform cited in the Educate America Act (see page 5) to the goals and objectives set forth for environmental education (see page 36), it is clear that the two efforts have similar aims. Both are concerned with connecting learning to the real world and applying knowledge across disciplines. Both emphasize developing students' abilities to make sound decisions and to engage as active citizens. The articles and program profiles in this publication describe how environmental education can help achieve the goals of public education reform. Specific examples are referenced throughout this primer.

Curriculum in Education Reform

Most traditional curricula emphasize student command of basic skills and academic subject matter. In contrast, curriculum reform efforts generally focus on applying content knowledge using higher order thinking skills (such as problem solving) and connections to the world beyond the classroom. Important trends in curriculum reform include:

- **Standards.** One of the most prominent features of the education reform landscape is the development of standards. Standards define what students should know and be able to do at different grade levels. National and state standards have been developed for many academic disciplines and are now driving curriculum content.

- **Higher Order Thinking Skills.** Curriculum reform efforts promote development of skills such as logical analysis and problem solving. More traditional curricula focus on memorization and repetitious practice of basic skills.

- **Depth Not Breadth.** Traditional curricula tend to cover, sometimes superficially, many topics within each subject area. Curriculum reform efforts usually promote in-depth study of fewer topics.

- **World Beyond the Classroom.** Faced with more traditional curricula, students are prompted to ask, "Why do I have to learn this?" or "Will I ever use this?" Service Learning, School-to-Work, and other reform-based curricula emphasize real world topics and learning situations.

Environmental topics are particularly appropriate for curricula that emphasize the world beyond the classroom, depth of treatment, and higher order thinking skills. The article on page 4 offers examples of elementary, middle, and high school level curricular changes that use the environment as a basis for learning, and the article on page 48 discusses relationships between standards and environmental education.

Instruction in Education Reform

Many education reform efforts focus on instruction: the ways we expect teachers to teach and students to learn. These efforts generally place increased emphasis on professional development for teachers, collaboration among students and among teachers, and student-centered teaching strategies. Important trends in instructional reform include:

- **Teachers as Professionals.** Teachers are often not given the basic tools and learning opportunities generally associated with professional occupations. Many reform efforts emphasize increasing the preservice requirements for teacher certification. Others stress providing high-quality professional development programs for inservice teachers to continually update their content knowledge and instructional skills. Given teachers' schedules, professional development efforts are most successful when time for them is institutionalized into the school year.

- **Multidisciplinary/Team Teaching.** Especially in upper grades, traditional classrooms tend to fragment learning into compartments labeled English, history, science, or math. They isolate teachers from one another. Some reform strategies take advantage of the fact that topics in the real world naturally involve linkages among the different disciplines. Multidisciplinary lessons enable teachers to work together as a team.

- **Constructivist/Student-Centered Learning.** Rather than treat students as passive learners who absorb information provided by lectures and textbooks, some reform efforts focus on enabling students to take more active responsibility for their learning.

- **Active/Collaborative Learning Strategies.** These efforts promote hands-on instruction and students working in cooperative groups to develop content and problem-solving skills.

- **Technology.** The explosive growth of the Internet and other communications technologies provide new opportunities for students to move beyond the confines of their school. Technological skills are obviously important as students graduate and move into the job world or post-secondary education. In addition, the Internet allows students to find resources, to talk and collaborate with scientists, and to exchange data and ideas with other students.

Environmental topics are particularly appropriate for multidisciplinary and hands-on instruction. Since environmental education aims for students to develop new understandings and apply their knowledge through responsible action, it supports constructivist, student-centered learning. Global technologies such as the Internet are particularly appropriate for sharing environmental data, such as tracking animal migrations or monitoring water quality in a geographically extensive watershed. To explore instructional strategies that use the environment as a foundation for learning, read the article on page 17. Environmental education training for preservice and inservice teachers is addressed in the articles on pages 34 and 40 respectively.

Assessment in Education Reform

Traditionally, written tests have been the primary method of assessing student understanding. Assessment reform acknowledges that testing provides a limited view of what students know, and therefore emphasizes the use of a broader variety of assessment strategies. Reform efforts also place greater stress on psychometric issues of validity, reliability, and bias. Important trends in assessment reform include:

- **Standards-Based Assessment.** Using rubrics (scoring guides that establish expectations for performance) and other tools, assessments are becoming more aligned with the standards that describe what students should know and be able to do. Rather than being compared with each other, students are scored by how well they achieve the desired learning skills or knowledge.

- **Alternative Assessment.** Rather than relying almost exclusively on written tests—still well used in appropriate circumstances—assessment often includes performance tasks, open-ended questions, and portfolios of student work.

Through its emphasis on engagement in action projects, environmental education is particularly conducive to using student projects and portfolios to assess a wide range of skills. Environmental education works well for skill-based and multidisciplinary assessments. The article on page 52 explores assessment strategies and gives examples of assessments that have been used in several environmental education lessons.

Education Reform at the School Site

To succeed, education reform has to occur at the individual school site. Many site-based reform strategies involve giving parents more options about which school their child will attend. Restructuring the school day to allow for longer, more in-depth studies, increasing parental involvement, and linking classrooms to the community are among other site-based reform efforts. Important trends in school site reform include:

- **Magnet Schools.** Magnet schools feature a unified curriculum that is generally based on either a specific curriculum area (such as science or environment) or a particular method of teaching and learning.

- **School-Based Management.** School-based management (SBM) is intended to improve education by transferring significant decision-making authority from state and district offices to individual schools. SBM gives principals, teachers, students, and parents responsibility for decisions about the budget, personnel, and curriculum.

- **Charter Schools.** Charter Schools are public schools that sign a contract ("charter") to guarantee a high level of student achievement. In exchange, a Charter School receives waivers that exempt it from many education code requirements and bureaucratic rules.

- **Privatization/Vouchers.** Some people advocate privatizing schools or issuing vouchers from public education budgets to families to cover tuition costs at private schools.

- **Parent/Community Involvement.** The need for and great value of increased participation by parents and other community members is a theme that runs across many school site reform efforts.

Environmental education can be especially appropriate for magnet schools because, by definition, magnet schools focus on a particular topic. With its emphasis on action projects involving local issues, environmental education is also germane to enhancing parent and community involvement. The program profiles on pages 13 and 56, and many of the programs highlighted in other articles, reflect successful efforts to restructure schools to accommodate new forms of teaching and learning.

Education reform and environmental education clearly have a lot in common. They share a fundamental goal: that of developing real skills and knowledge so students can make sound decisions. They use similar approaches: student-centered, problem-based, hands-on learning. Partnered, education reform and environmental education enhance both educational and environmental quality. Marry them and we can change the world!

RECOMMENDED WEB SITES

Putnam Valley's "Developing Educational Standards"
An annotated list of Internet sites with K–12 educational standards and curriculum framework documents.
http://putwest.loces.org/standards.html

U.S. Charter Schools
Uses web-based technologies to support educational innovation in charter schools.
www.uscharterschools.org

Coalition of Essential Schools
A growing national network of more than 1,000 schools and 24 regional support centers that coach schools through systemic change at the school site.
www.essentialschools.org

"Systemic Reform: Perspectives on Personalizing Education"
A collection of articles and papers examining systemic reform.
http://llanes.panam.edu/research/systemicreform

EdGateway

WestEd has developed EdGateway as a tool to help educators in both formal and nonformal settings find, organize, and share events, discussions, organizational information, and documents. Educators and their organizations use EdGateway to meet local and project-specific needs. At the same time they are joining a much larger educational community with which they can interact.

Currently EdGateway includes environmental and science educators and those involved in education reform networks. As this community grows larger and more comfortable with the web and EdGateway, WestEd will promote increasing collaborations across communities. A special site within EdGateway facilitates dialogue and collaboration between the environmental education and education reform communities. This site is a project the Environmental Education and Training Partnership (EETAP) and is funded by the U.S. Environmental Protection Agency, Office of Environmental Education. Participating in EdGateway is free of charge.

For more information on EdGateway and to experience its benefits first hand, visit www.edgateway.net/ee on the web.

Art Sussman, Ph.D., is a biochemist who directs environmental education projects and the Eisenhower Regional Math/Science Consortium at WestEd, one of the nation's ten regional educational laboratories. WestEd is also a partner in the Environmental Education and Training Partnership (EETAP).

Middle school students explore their feelings about protecting biodiversity in "The Spice of Life," an activity from World Wildlife Fund's *Biodiversity Basics.* (See page 21.)

POWERFUL PEDAGOGY—
Using EE to Achieve
Your Education Goals

by Judy Braus

Y ou're a new teacher with a head full of ideas. You want to be innovative and effective—on the cutting edge of reform. You want your kids to be excited about learning. And you think the environment is an important, cross-cutting theme that will engage your students. But you're a little overwhelmed. You've spent more than four years studying constructivism, cooperative learning, thematic teaching, learning styles, authentic assessment, interdisciplinary techniques, service learning, and what seems like a thousand other educational strategies, theories, and techniques.

So now what do you do? How do you put it all together? And how can you use environmental education as a vehicle to enhance and even transform your teaching? My colleagues and I asked more than a dozen seasoned educators to list the five most important instructional strategies that they would use to enhance learning. The group we surveyed included teachers, environmental educators, zoo and aquarium educators, professors, and curriculum developers—each with more than 15 years of teaching experience. Then we asked them to pick some of their favorite environmental education activities that use one or more of these strategies effectively.

It's not surprising that there were a lot of similarities in the instructional strategies that this select group of educators felt were most important. Many school systems and across the country have identified similar strategies to enhance learning, motivate students, and build better citizens. The twist that many teachers don't learn during pre-service training is that you can use environmental education to integrate these strategies and make them come alive—and at the same time, help students develop an environmental ethic and set of citizenship skills that will carry them into the future.

At the Top of the List

Here are the top picks from our ad hoc survey group. The resources at the end of this article elaborate on these strategies.

Constructivism: *Building on what students know.* Constructivism involves helping students learn new information in a way that makes sense for them and fits with their world view. As Cynthia Ellwood, a teacher in Milwaukee, Wisconsin, says, "At the very core of teaching is the task of helping students make connections between what they already understand and the new concepts, information, or skills we want them to learn."

Cooperative Learning: *Working in groups to solve problems, promote cooperation, build relationships among students, and get a taste of how the real world works.* The world's problems are rarely solved by individuals working alone. Learning to build on each other's strengths is what pushes creativity, insight, and achievement. David W. Johnson and Roger T. Johnson, two experts in cooperative learning, point out that "More than five hundred research studies now report that students learn better when they work cooperatively." (See the resources on page 24 to find out more about cooperative learning and how some educators differentiate between cooperative learning and collaborative learning.)

Multidisciplinary and Interdisciplinary Teaching: *Helping students to understand the interconnectedness of knowledge, and to use knowledge from several disciplines to examine individual and societal problems.* Environmental issues are interdisciplinary by nature and offer the perfect platform for drawing connections among disciplines and areas of study (such as science, social science, technology, politics, and philosophy) and within disciplines (such as genetics, conservation biology, geology, and physiology). (For more about the relationships among fields of knowledge, see *Interdisciplinary Curriculum: Design and Implementation* edited by Heidi Hayes Jacobs (ASCD, 1989), which also addresses crossdisciplinary, multidisciplinary, and transdisciplinary definitions and approaches.)

Problem-Solving and Critical Thinking: *Exploring issues to give students experience investigating and defining problems, identifying solutions, implementing action plans, and designing ways to measure success.* Solving complex environmental problems requires non-linear thinking and improves the ability to think "outside of the box." Martha Monroe, a professor at the University of Florida, emphasizes that "problem-solving takes experimentation, creativity, flexibility, risk taking, and independent thinking."

Community Learning: *Using the community to explore real issues that promote learning and, at the same time, benefit the community.* In some school systems, community learning is practiced as "service learning"—programs that offer students credit for volunteering in the community. Many teachers also promote community learning by facilitating environmental action projects in the community that promote problem solving, action research (reflecting on action and practice), cooperative learning, and other educational strategies.

Values and Ethics: *Examining and reflecting on the underlying values that influence individual and societal actions with regard to issues, and building a personal ethical framework that helps distinguish right from wrong.* Many school systems are now emphasizing character education, which focuses on moral and ethical development and activities that help students clarify their values. As Bill Andrews, Education Programs Consultant in the California Department of Education Office of Environmental Education, says, "Values are important to social change and to citizenship education. If we want to build a citizenry that cares about the environment and takes responsible action, we can't ignore values."

Other strategies and approaches listed by educators included catering to a variety of learning styles, ensuring that all teaching is relevant to student interests and using theme-based learning that includes authentic assessment (which is discussed on page 52) and emphasizes depth over breadth. Of course, some teachers mentioned that you can't design effective teaching programs without paying attention to age appropriateness, learning environment, and state and national standards, including Goals 2000 (see box on page 5).

To show how you can turn these instructional strategies into lessons and activities, we've included a synopsis of four sample activities. These are just samples of the thousands of resources that can help you create your own lessons and units. The challenge is to use these resources as tools to shape a learning program that works for your situation, making use of your talents and interests, as well as those of your students.

Activity Sampler

Visit a hundred classrooms in America, and you'll see dozens of different strategies, approaches, activities, and techniques—many of them using the instructional strategies we highlighted earlier. You'd see some teachers using detailed daily lesson plans and others going more with the flow. Some would be using textbooks; others would be teaching from lessons they designed using newspapers, the Internet, supplementary activity guides, textbooks, and anything else they can get their hands on.

We've summarized four activities here, with a brief analysis that explains why we think each models good teaching. However, no one activity embodies all the educational strategies outlined earlier, and we encourage you to look at the activities in their original form.

There are also hundreds of other quality resources available. We encourage you to explore the compendiums developed by the North American Association for Environmental Education, World Wildlife Fund, and the California Department of Education, which are listed at the end of this article. All the compendiums rate supplementary curriculum materials against state or national guidelines and highlight the materials' strengths. They can help you select the most appropriate resources. To help you use the environment as the integrating force in your teaching, many of the educational resources cited include conceptual and skill frameworks, unit planning ideas, and other support to help build effective lessons.

Activity #1: Every Drop Counts

Source: *Project Learning Tree* (PLT) is a national environmental education program that uses forests as a window to explore environmental issues. This activity is adapted from the K–8 activity guide, which includes about 100 activities, a conceptual framework, and many ready-to-copy activity sheets. PLT also produces a series of high school modules and reaches more than 30,000 educators each year through workshops and training.
For more about PLT, see the web site at www.plt.org.

Water Use

Breakdown of the 394 billion gallons* (1491 billion liters) of water used daily in the United States:

Thermoelectric Utilities ...	187 billion gal./day
Irrigation	137 billion gal./day
Public Supply	36 billion gal./day
Industry	26 billion gal./day
Rural & Livestock	8 billion gal./day
Total	**394 billion gal./day**

Daily water use:

Flushing the Toilet	**1.5–7 gal.
Taking a Shower	25–50 gal.
Taking a Bath	36 gal.
Washing Clothes	35–60 gal.
Washing Dishes (machine)	10 gal.
Brushing Teeth	2 gal.
Washing Hands	2 gal.
Watering the Lawn	5–10 gal./min.

* To convert gallons to liters, multiply by 3.785
** Water-saving toilets are now available that use as little as 1.5–3.5 gallons (5.7–13.2 l) of water

Used with permission from *Project Learning Tree.*

Overview: It's easy to waste water and even easier to take water for granted. Water pours out of our faucets as though it were endlessly available. But the truth is that fresh water supplies are dwindling. Fortunately, it's just as easy to conserve water as it is to waste it. Try this activity to help your class (and maybe the whole school) cut back on water waste.

Age: Upper Elementary and Middle School

Objectives: Students will (1) monitor their daily actions and estimate the amount of water they use in a day, (2) describe how water is wasted and why it is important to conserve it, (3) design and implement a water conservation plan, and (4) determine the amount of water and money saved through their plan.

Summary of Approach: In the first part of this activity, students estimate the amount of water they use every day and then try to determine if their actual water use is more or less than they predicted. They estimate the amount of water they use for drinking, showering, cooking, brushing their teeth, using the toilet, and so on. They can do this two ways: one by using a chart that shows average water use for each activity; another by determining the average flow per second, timing their water usage, and coming up with an estimate. Next students brainstorm how they might be able to reduce their water use, try their ideas out, and see if their suggestions work by again monitoring daily water use. Finally, they investigate how much water the school can save if everyone uses simple water conservation practices. Each group researches one aspect of water conservation (such as installing faucet aerators in restrooms or putting toilet dams in toilet tanks throughout the school) and together they create a water saving plan. Students then estimate the savings of both water and money and try to "sell" their water conservation plan to school administrators and parents.

Other Comments: Activity includes background information (see box), a ready-to-copy activity sheet to help students record their water use for the day, and assessment strategies (which in this case suggest that teams of students design a brochure for the general public, urging them to save water in their daily lives).

Analysis: Emphasizes stewardship and models environmental responsibility. Highlights cooperative learning. Interdisciplinary, emphasizing connections between math and science. Also promotes community learning by examining individual, school, and home water use. Other good points: good graphics with easy-to-use chart, grade appropriate, explores values about water, provides options for community action, and engages students in active learning.

WHY CARE ABOUT BIODIVERSITY?

It is important to conserve the diversity of life for medical and economic reasons. Plants and animals could provide us with additional foods, medicines, and other products that will save lives and benefit society.

It is important to protect the diversity of life because biodiversity helps maintain important ecological processes such as oxygen production, pollination, and flood control that, in turn, help support all life on Earth.

Our lives would not be as rich if we lost species such as bears, beetles, hawks, frogs, lizards, and tigers, and the habitats where they live. The rich diversity of life also allows for important recreational activities such as hiking, fishing, camping, and birding.

It is important to protect the diversity of life because no generation has the right to destroy the environment and resources on which future generations depend. It is our responsibility to take care of the diversity of life.

It is important to protect the diversity of life because biodiversity provides inspiration and provokes curiosity and imagination. Art, music, and poetry are often inspired by the diversity of life. And many of our technological advances, such as flight, have been inspired by examples found in nature.

It is important to preserve the diversity of life because all species have a right to exist.
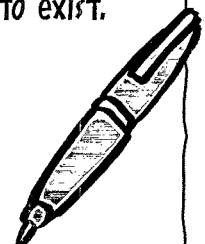
Activity #2: The Spice of Life

Source: *Biodiversity Basics* is the first module in the *Windows on the Wild* biodiversity education program developed by World Wildlife Fund (WWF), with input from hundreds of educators around the world. *Windows on the Wild* is designed to educate people about biodiversity and stimulate critical thinking, discussion, and informed decision making on behalf of the environment. WWF partners with a variety of communities and institutions around the world to enhance education and conservation.
For more about Windows on the Wild and WWF, visit the web site at www.worldwildlife.org

Age: Middle School

Overview: People's feelings about biodiversity issues do not depend on just their knowledge of these issues and the sciences that relate to them; people's feelings also depend on personal belief systems and values. This activity is designed to give your students a chance to examine their values and to sharpen their own thinking by sharing their opinions and feelings with their peers. The activity would be conducted after students have developed an understanding of the meaning of biodiversity.

Objectives: Students explore personal beliefs and values about the importance of biodiversity.

Summary of Approach: In advance of the activity, the teacher writes six statements, each giving a different reason for protecting biodiversity, on separate pieces of flip chart paper (see page 20). He or she hangs the sheets around the room, covering them to prevent students from seeing the statements. To get started, students discuss whether or not it's important to protect biodiversity, and if so, why. They are encouraged to think about reasons they have read; reasons they have heard others express; or their own, personal views. Then they compare their ideas with the reasons listed on the chart paper.

Students are then asked to consider the statements carefully and to pick one of the statements and go stand near it. The one they pick should be one they feel strongly about—either because they think it's particularly important or because they disagree with it. If they don't see a statement that reflects their viewpoint, they can stand at a seventh sign marked "other."

Students at each statement are encouraged to discuss among themselves why they chose that particular statement, with reminders that each person will have personal reasons for making that choice and that the group should explore some of those reasons. Then one person summarizes each small group discussion. Finally, the teacher facilitates a class discussion, using some guiding questions to explore issues and challenge each group's thinking.

Other Comments: Activity includes introduction, step-by-step directions, a list of statements and guiding questions, an assessment, extensions and resources, and writing ideas. Activity is connected to a framework, is linked to other activities that provide the prior knowledge needed to take part in the activity, and is included in an overall unit to explore biodiversity issues.

Analysis: Emphasizes values and ethics without promoting a particular point of view. Highlights connections between science and social studies, and promotes critical thinking and problem-solving skills such as evaluating a position, taking a position, and defending a position. Other good points: allows students to think about the issue first, then get out of their seats to discuss how they feel with other students; promotes writing skills.

Activity #3: A Research Request

Source: *Eco-Inquiry—A Guide to Ecological Learning Experiences* is made up of three modules focusing on food webs, decomposition, and nutrient recycling. It embeds hands-on science within thematic, multi-dimensional learning experiences. The modules contain investigations that build students' understanding of ecological processes in their local environment. The *Eco-Inquiry* guide includes classroom-tested lesson plans with practical teaching strategies, expected learner outcomes, assessment strategies, and cross-curricular extensions.

Age: Upper Elementary and Middle School

Overview: In this module, "Who Eats What?" students start out by receiving a request to survey animals and their food resources on a local site. Then they talk about what they already know and how they could find out more. In following activities of the module, the students have opportunities to investigate the local site, determine the food web of the site, and process, apply, and assess what they learned.

Objectives: Throughout the lesson, check that students (1) realize that people can harm or protect the food resources animals need to survive, (2) have a mental image of the study site, and some ideas about what animals live there, (3) are curious and have questions about animals and their food, and (4) have ideas of how to look for animals and animal signs.

Summary of Approach: Students take on the role of ecologists and are charged with investigating an outdoor study area to find out what animals live there and what those animals eat to survive. This preliminary activity is designed to get them thinking about what they and other people already know about the study area. The first part of the activity is a discussion to find out what the students already know

about the creatures living in the site and what questions they might want to answer. The final part of this activity has the students work in pairs to figure out what animals live in the outdoor area and how they could determine what the animals eat.

Additional Comments: This is the first activity of the module called "Who Eats What?" The guide contains two other modules, "Decomposer Dynamics," and "From Rot to Radishes." There are a variety of assessment ideas, resources, field trip tips, and other information to help teachers carry out the activities and modules.

Analysis: Activity takes a constructivist approach to helping students start a unit that explores ecology. Students have a chance to talk about what they know and what they want to know. As they proceed through the unit, they take part in investigating, thinking, processing, and applying. The modules in *Eco-Inquiry* cover the concepts in depth and give students a chance to explore and understand their local environment. The activities also encourage student-directed, cooperative learning.

Activity #4: Dilemma Derby

Source: *Project WET* is a national nonprofit water education program for educators and young people in grades K–12. This activity is adapted from the *Project WET Curriculum and Activity Guide*, a collection of more than 90 water-related activities that are hands-on, easy to use, and fun! The curriculum is available to educators through workshops provided by state Project WET coordinators and trained facilitators.

Age: Middle and High School

Overview: Managing water resources often creates dilemmas. As with most dilemmas, water resource management can involve conflicts between what one wants to do versus what one believes should be done. People use various approaches to determine a course of action when confronted with a dilemma—from flipping a coin to conducting extensive research and attending high-powered meetings. In this activity, students debate the pros and cons of different solutions to water management issues and use critical thinking skills in the process.
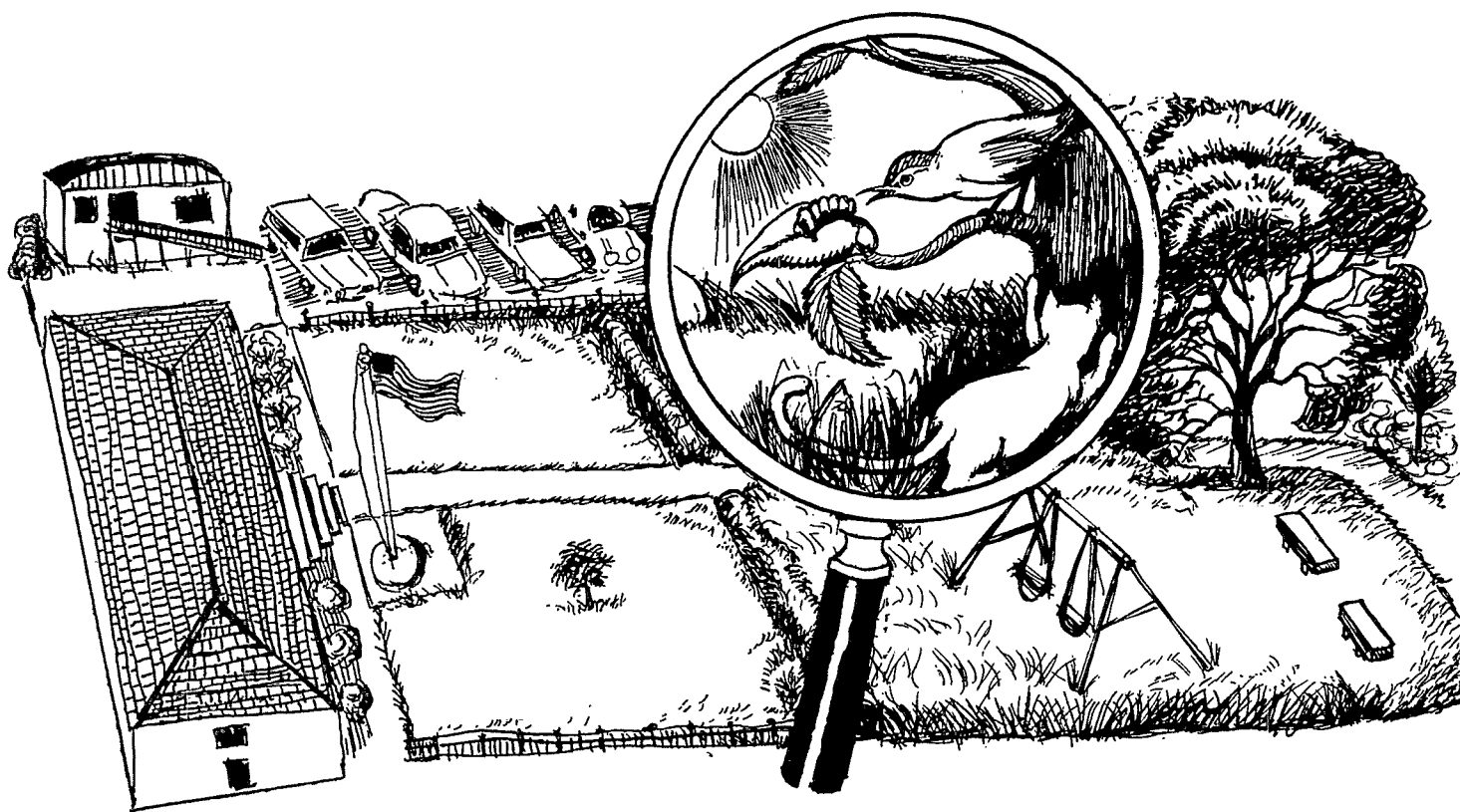

Illustration by Lisa Morganstern from *Eco-Inquiry: A Guide to Ecological Experiences for the Upper Elementary/Middle Grades* by Kathleen Hogan. 1994. Kendall/Hunt Publishers. (800)-228-0810. Reprinted with permission.

Objectives: Students will outline reasons that managing water resources can create dilemmas; and identify, analyze, and select actions related to a water resource dilemma.

Summary of Approach: To start the discussion about water issues, students are provided with a scenario that presents a dilemma. They list the reasons why they think it is a dilemma and discuss some of the approaches they might use to resolve it. Then they divide into small groups and address a variety of water-related issues that are provided in the activity. With each dilemma, group members discuss the situation and decide what to do and why. They must select one of the available options or identify an alternative course of action. One approach to making a decision is to rate each option.

One member of each group reports on their dilemma, identifying why it's a dilemma and what course of action the group favored. The class then evaluates the option that was selected, and, if applicable, provides alternatives that might be better. They then discuss whether taking part in this activity could help them react to real-life water dilemmas.

Other Comments: Activity includes background information, step-by-step directions, assessment ideas, and extensions and resources. It is also connected to a conceptual and skills framework, linked to other activities that provide the prior knowledge needed to take part in the activity, and is included in several units that provide different ways to teach about water issues. Activity includes ten dilemmas.

Analysis: This interdisciplinary activity emphasizes critical thinking skills and problem solving. It also promotes group cooperation and allows students to explore options for reaching consensus. Students learn skills for resolving issues that they can apply to current and future dilemmas.

PROJECT WET
Water Education for Teachers

DILEMMA 10:
You are a taxpayer in a coastal state that owns large tracts of land which historically were wetlands. Through complex engineering, the land has been drained to provide flood protection and to open the area for development and agriculture. These accomplishments have saved lives and improved the standard of living for many residents, while increasing revenues from crop exports. However, populations of some organisms living in the wetlands (such as scarlet ibis, wood storks, and panthers) and along coastal areas (such as coral reefs, lobsters, and shrimp) have been greatly reduced. Shrimpers and other fishing industries have suffered from low harvests, and the number of tourists has declined. There is a proposal to restore the historic water flow pattern in some of these areas. This action will increase your taxes. What should you do?

1. Vote down the tax; you pay enough in taxes already.

2. Vote for the tax; a restored, healthy ecosystem is good for everyone.

3. Vote down the tax because communities will be flooded.

4. Vote for the tax because your best friend says you should.

5. Other?

PROJECT WET
Water Education for Teachers

DILEMMA 4:
You and a friend are hiking, and you see someone dumping a 55-gallon drum of a dark liquid into a shallow stream. What should you do?

1. Go over and ask what is going on.

2. Run home and call the police.

3. Wait until the person leaves, then investigate by smelling and feeling the liquid.

4. Take down the license plate number of the nearby truck and report the situation to the fire department.

5. Other?

RECOMMENDED READING

Cooperative Learning in Middle-Level Schools by J. Rottier and B. Ogan (National Education Association, 1994).

Enriching the Curriculum Through Service Learning by Carol W. Kinsley and Kate McPherson, eds. (Association for Supervision and Curriculum Development, 1995).

Environmental Education for Empowerment: Action Research and Community Problem Solving by William B. Stapp, Arjen E. J. Wals, and Sheri L. Stankorb (Kendall/Hunt Publishing Company, 1996).

Environmental Values Education: An Exploration of Its Role in the School Curriculum by William Scott and Chris Oulton (Journal of Moral Education, 1998).

Frames of Mind: The Theory of Multiple Intelligences by Howard Gardner (HarperCollins Publishers, 1983).

In Search of Understanding: The Case for Constructivist Classrooms by Jacqueline Grennon Brooks and Martin G. Brooks (Association for Supervision and Curriculum Development, 1993).

Structuring Cooperative Learning: Lesson Plans for Teachers by D. Johnson, R. Johnson, and E. Holubec (Interaction Book Company, 1987).

The Courage to Teach: Exploring the Inner Landscape of a Teacher's Life by Parker J. Palmer (Jossey-Bass Publishers, 1998).

Their Best Selves — Building Character Education and Service Learning Together in the Lives of Young People by Bruce O. Boston (Character Education Partnership, 1997).

What Matters Most: Teaching for America's Future. Report of the National Commission on Teaching and America's Future. September 1996.

RESOURCES

Project Learning Tree
1111 19th Street NW, Suite 780
Washington, DC 20036
(202) 463-2462
www.plt.org

Windows on the Wild
World Wildlife Fund
1250 24th Street NW
Washington, DC 20037
(202) 778-9669
www.worldwildlife.org

Eco-Inquiry
Kendall/Hunt Publishing
Company
4050 Westmark Drive
Dubuque, IA 52202-1840
(800) 228-0810
www.kendallhunt.com

Project WET
201 Culbertson Hall
Montana State University
Bozeman, MT 59717-0570
(406) 994-5392
**www.montana.edu:
80/wwwwet**

TO ORDER THE COMPENDIUMS

The Environmental Education Collection: A Review of Resources for Educators, Volumes 1, 2, and 3, published by the North American Association for Environmental Education (NAAEE), 1997-1998.

The Biodiversity Collection: A Review of Resources for Educators, published by NAAEE and World Wildlife Fund, 1998.

NAAEE Publications Office
410 Tarvin Road
Rock Spring, GA 30739
(706) 764-2926
www.naaee.org

Environmental Education Compendia, published by the California Department of Education Office of Environmental Education:

Air Quality
Air Resources Board
Office of Communications
2020 L Street, 5th Floor
Sacramento, CA 95814
(916) 322-2990

Energy Resources
California Energy
   Commission
Public Education
1516 Ninth Street, MS-29
Sacramento, CA 95814-4219
(916) 654-4989

Human Communities
California Energy
   Commission
Public Education
1516 Ninth Street, MS-29
Sacramento, CA 95814-4219
(916) 654-4989

Integrated Waste Management
California Integrated Waste
   Management Board
8800 California Center Drive
Sacramento, CA 95826
(916) 255-2385

Natural Communities
State Water Resources Control
   Board
Office of Legal & Public Affairs
901 P Street
Sacramento, CA 95814
(916) 657-1261

Water Resources
Department of Water
   Resources
Publications, Room 338
1416 Ninth Street, Box 942836
Sacramento, CA 94236-0001
(916) 653-1097

**All six compendiums are also available on the Internet at
http://ceres.ca.gov/education/educators/nat_sci.html**

Judy Braus is Director of Education at World Wildlife Fund, an international conservation organization whose mission is to conserve biodiversity worldwide. She oversees a variety of education programs around the world, including Windows on the Wild, a biodiversity education program, and Education for Nature, a leadership and capacity building program for individuals and institutions in Africa, Asia, and Latin America. Judy is currently the president of NAAEE.

California Dreamin' Becoming a Reality

People often think of California as a state that takes the lead—in healthy eating, physical fitness, fashion fads, and movie stars. Admittedly, environmental education is not the first thing to come to mind when someone mentions the Golden State. But there are many reasons it could be!
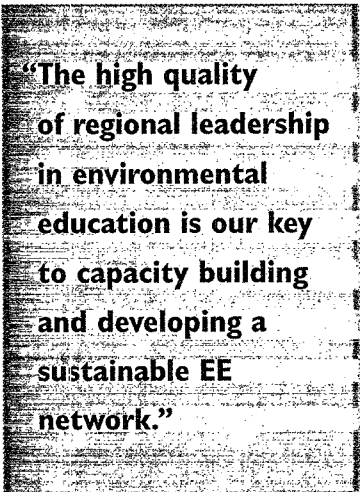
Throughout California, students are engaged in environmental education programs made possible by the California Department of Education Office of Environmental Education (CDE). Through an environmental education grant program established by the state's Conservation Education Act of 1970, CDE annually commits over $700,000 for site development projects, implementation of programs that promote responsible action projects (such as environmental monitoring), networking events, and planning and implementation of articulated scope and sequence curricula over several grades.

To help teachers find quality lesson plans, CDE has co-published environmental education compendia that identify several hundred high quality curricula in six topic areas: energy resources, water resources, integrated waste management, air quality, natural communities, and human communities. Teachers and other educators evaluated the materials using an evaluation tool developed by CDE in collaboration with other state agencies that partnered with CDE to develop the compendia. The tool was designed to evaluate environmental curricula that align with instructional materials criteria adopted by the California State Board of Education and with other policies framed by the State Legislature and CDE. Information on obtaining the compendia can be found on page 24.

CDE has also developed its own integrated curriculum, *A Child's Place in the Environment,* for first through sixth grade classrooms. The units offer sequential sets of theme-based lessons that incorporate science, language arts, social studies, and visual and performing arts, and correlate to the State Frameworks and State Standards in those disciplines.

The *California Guide to Environmental Literacy* (CGEL), due out later this year, is another tool being developed by CDE. CGEL will assist teachers in using the environment as an integrating context in all disciplines as a means of developing environmental literacy while studying core, standards-based concepts. Subtitled *Using Hope, Systems Thinking, and Holistic Instruction to Build Sustainable Communities,* CGEL is a voluntary curriculum-support document designed to help schools, curriculum devel-

> "The high quality of regional leadership in environmental education is our key to capacity building and developing a sustainable EE network."

opers, and teachers restructure curriculum around the environment. It describes a systems approach to education and shows how this approach can be implemented in the classroom by citing successful examples from schools across California.

One principle of systems thinking is networking, and California is putting this principle into action statewide. The California Regional Environmental Education Coordinators (CREEC) Network's mission is to "provide educators with access to high quality environmental education resources to enhance the environmental literacy of California students." Bill Andrews, Education Programs Consultant for CDE, says, "The high quality of regional leadership in environmental education is our key to capacity building and developing a sustainable EE network."

In its second year, the CREEC Network has 11 regional hubs throughout the state, each with its own fiscal agent (usually a county office of education or a local non-profit organization) and one or two part-time coordinators. The coordinators work to build relationships between area teachers, environmental educators in non-formal settings, and college and university-based teacher educators. Each region functions relatively independently, with guidance from CDE, implementing such networking activities as creating web sites, on-line discussion groups, professional gatherings, regional calendars and resources guides, and promoting workshops and other events in the area. The CREEC Network is funded primarily by CDE, along with three other state agency partners. The Network has recently received additional funding from the U.S. Environmental Protection Agency Office of Environmental Education for further organizational and financial development.

Many of the environmental education efforts in California have been developed under the auspices of the Environmental Education Advisory Committee, a group of teachers and representatives from agencies and organizations that meets twice yearly to set priorities and monitor progress on CDE's environmental education activities. California is also participating in both the State Education and Environment Roundtable (see page 59) and the National Environmental Education Advancement Project, based at the University of Wisconsin-Stevens Point. Through these efforts, California is increasing the state's capacity to develop and deliver quality environmental education.

For more information about environmental education programs in California, contact:
California Department of Education
Office of Environmental Education
721 Capitol Mall
PO Box 944272
Sacramento, CA 95814
www.cde.ca.gov/cilbranch/oee.

Educating for a More Livable Urban Environment

by
Emilio Williams &
Julian Agyeman

E nvironment: The word conjures up images of mountain peaks climbing to the sky, towering pines, and soaring hawks. For most U.S. students, however, the environment they experience daily more likely includes buildings, street trees, and pigeons. It is this environment—the complex urban environment—that students need to understand if they are to contribute as confident citizens to their community's future; one of the key goals enumerated in the 1994 Educate America Act, Goals 2000 (see page 5).

A key attribute of good environmental education, if not all education, is relevance of learning to students' lives. Toward this end, education reform efforts encourage such strategies as service learning, project-based learning, and school-to-work programs. If learning is to be meaningful for urban students, and if these students are to leave school prepared to make productive contributions to their communities, we must include issues specific to urban environments in our education reform efforts. These issues include equality, social and environmental justice, civil rights, and respect for other cultures and a diversity of values and language.

The interplay of people, cultures, natural cycles, social and economic systems, architecture, and transportation systems in the urban setting creates rich opportunities for relevant study of the local environment. The urban setting also poses real challenges. While issues such as transportation, habitat depletion, and air and water pollution are important, many students and teachers living in cities have more pressing concerns. Violence, drug abuse, lack of recreational opportunities, or rodent infestations may be daily realities. For many urban students, relevance requires developing the knowledge and skills necessary to address these immediate issues.

Environmental Education in the Urban Setting

Environmental education in the urban setting has as its core the same aims as quality environmental education in any setting: developing peoples' awareness, knowledge, attitude, skills, and participation. Whether learning takes place in a city or a rural setting—or anywhere in between—the fundamental process of learning does not change, even while the subject matter may. It is as appropriate for rural students to address pollution of a local stream (see page 56) as it is for urban students to address issues such as local overcrowding, hunger, and safety. It is equally appropriate, and equally im-

portant, for urban students to study and experience the connections to the natural world within their communities.

In any setting, interdisciplinary, student-centered teaching methods that draw on students' real-world experiences are the foundations of effective learning. As we broaden the scope of environmental education to include the diverse issues facing urban youth, the essential goals of both environmental education and education reform remain intact: preparing students to think critically about what is happening around them, and to facilitate the changes they perceive as necessary for their welfare, and the welfare of their community and the world beyond.

The basic "rule" of environmental education in urban areas, also called urban environmental education, is that local communities' needs come first. In many cities, where there are problems like pollution and rodent infestation, there are also concentrations of people living in poverty and poor conditions. Human inequality is mirrored by low environmental quality. Effective urban environmental education involves listening closely to the perceptions and priorities of urban residents, and creating programs that are relevant and sustainable over the long term. Urban environmental education must be rooted in local communities in order to take up the challenge of making the urban environment a more livable and sustainable system.

Training Student Organizers

In a third exemplary program, Training Student Organizers (TSO), students in New York City schools work with educators from The Council on the Environment of New York City (CENYC) to design their own environmental improvement projects. Sample projects have included:

- Students from 11 schools in three New York boroughs organized water conservation projects including cutting home water use by hundreds of thousands of gallons, and reporting defective fire hydrants to the New York City Department of Environmental Protection for repair.

- Young people from Intermediate School 318 organized two public education events that reached more than 300 people with information on the proper use and disposal of hazardous household products and alternatives to these products.

- Responding to the relatively high number of lead poisoning cases in their neighborhood, students

from Sts. Cyril and Methodius School wrote press releases—in English and Polish—about the importance of testing young children for lead poisoning and the availability of a free testing service.

TSO helps students gain citizenship skills, such as communicating, using media, group problem-solving, and conducting community education and action. They also gain experience in identifying, researching, and addressing environmental problems on their school sites, in their homes, and throughout their communities. The projects, which are designed by the students, always involve content and skills from several disciplines, and reflect the diverse audiences and issues inherent in learning in the urban setting.

Educators from CEYNC work with participating classes once weekly for at least one semester and more often for an average of six years. The program is available free of charge to New York City schools, funded through contributions to CEYNC, professional development workshops for teachers and students in TSO methods, and the sale of curriculum materials.

> Garden, for our souls to tend. Summit, for us to reach for. Community, where we work together. Environment, what we create for ourselves.
>
> — E. Ritchie, Summit School student

A Case in Point: The Summit Garden Project

One example of such an urban environmental education program is the Summit Garden project in Seattle's K–12 Summit School. During the spring of 1997, some 60 seventh- through twelfth-grade students in Crystie Ballard's "Community and the Environment" classes created a school yard garden with raised beds of perennial flowers, vegetables, and herbs; a landscaped wetland area; and a sitting area for students and neighbors. The project was funded in part by the Alliance for Education and the Puget Sound Urban Resources Partnership.

As part of an effort to provide real-world learning experiences, students surveyed neighborhood residents to learn about the local environment. They also conducted a school resource inventory to identify ways to curb waste and promote environmental stewardship at the school. These activities helped students realize the need for a "natural refuge" on the school grounds. Many students wanted a place to connect with nature at school.

The idea of the garden took shape out of that desire. As part of the project, students went door-to-door to houses around the school, informing neighbors about the project and inviting them to join in. Many did, and what resulted was the transformation of a little-used part of the school grounds into a garden area that adds beauty to the neighborhood and provides habitat for birds and insects.
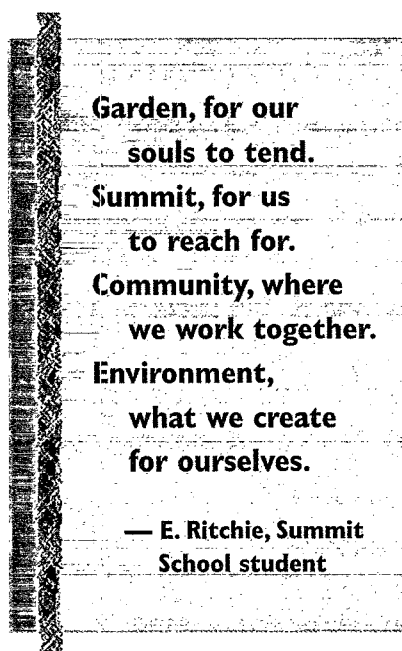
Ninth grade students at the High School for Environmental Studies test for ground level ozone during a Training Student Organizers project. A report on their findings was sent to the New York City Commissioner for Environmental Protection.

The garden project also offers opportunities for hands-on studies, perhaps best endorsed by one participating student, who said, "When I was in fourth grade and we learned how a plant grows, we could have used a place like this to have a better example—instead of little seeds inside foam cups." Students had a great deal of ownership over project development, thus cultivating their problem-solving and group decision-making skills. In addition, disciplines such as art, social studies, writing, and science have all been integrated into the formation of the garden.

Irvine Natural Science Center's Natural Connections Project — A VINE Project Site

In another exemplary project, Natural Connections, third and fourth grade students in 13 Baltimore City public and private elementary schools learn about plants, animals, and ecological relationships right in their own schoolyards. These urban settings, with lots of cement and asphalt, come alive for students with the help of volunteers from nearby high schools and colleges.

In keeping with one prominent component of many education reform efforts, most of the volunteers are high school teens who earn service-learning credits they need to graduate. The program coordinator at the Irvine Natural Science Center trains the high school teens and helps get them to the elementary school on scheduled days. Once there, each pair of teens works with a group of third and fourth graders.

Together, teens and children discover the diversity of things living around them. One week they may search for, collect, and sort leaves to find how many different kinds of plants grow in the schoolyard. Another week they may use homemade insect nets to discover tiny animals living in the grass. As a result of all these experiences, both teens and children gain a new understanding of the ecosystem in which they live and their place in it.

This project is part of a larger network called Volunteer-led Investigations of Neighborhood Ecology (VINE). A program of the North American Association for Environmental Education, VINE supports environmental education in urban neighborhoods.

Teens work with third and fourth graders in the VINE project.

Principles of Effective Urban Environmental Education Programs

After observing outstanding programs such as the Summit Garden, Natural Connections, and Training Student Organizers, and after gaining input from hundreds of people involved in education, the environment, and urban communities, we have gleaned five essential principles of high-quality urban environmental education programs. Adapted from NAAEE's *Guidelines for Urban Environmental Education,* these principles form a framework that environmental educators may use to inform their knowledge of urban environmental education and to help in program and project development.

1. Effective urban environmental education is based in local communities.

Urban environmental education works in the context of the local community and draws on the capacities and needs of all of its people as its driving force. It includes all parts of the community, reflecting both the community's demographic diversity and its cultural values.

In the Natural Connections program, for example, high school teens were seen as a resource rather than a detriment to the community. By calling on them to work with young students, the project helped the teens gain self-confidence, clarity in their career goals, and personal satisfaction from helping the community.

2. Effective urban environmental programs build a sense of community.

Aligning with Goals 2000's call to promote partnerships and increase parental involvement in schools (see page 5), interactions among community members help to develop a stronger sense of community. Urban environmental education deepens a community's self-understanding; builds a sense of mutual respect, ownership, and belonging; and enhances residents' ability to contribute to the community's well-being.

In the Summit Garden project, collaboration among students was the driving force that enabled so much work to get done in so little time. According to one of the teachers involved in the project, "Everything that happened, happened in groups." The group work allowed students to support each other, select areas of particular interest, and boost their skills in working together across age levels to achieve a common vision.

> When I was in fourth grade and we learned how a plant grows, we could have used a place like this to have a better example— instead of little seeds inside foam cups.
>
> — Summit School fourth grader

3. Effective urban environmental education builds understanding of the urban environment as a system.

Urban environmental education builds an understanding of cities as complex systems that blend nature and culture, and ecology and society. Human systems are often thought of as being separate from natural systems, but cities illustrate their interconnections. Urban environmental education can integrate issues and aspects of issues that are often disconnected. In building connections with the community and with local organizations, for example, participants in the Training Student Organizers program begin to see their schools and their neighborhoods as interrelated parts of the same urban system.

4. Effective urban environmental education programs use the local environment as a setting for learning.

Urban environments are rich settings for learning. Urban residents can develop a strong foundation for expanding knowledge by understanding the workings of the immediate surroundings.

The Natural Connections project used the immediate urban schoolyard as a setting for learning. Teachers reported that by using the school grounds in this way, students were very motivated to complete their writing and graphing tasks, and to learn more about their immediate environment.
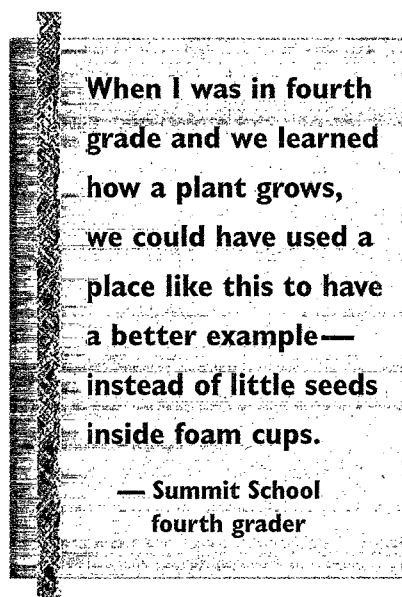
5. Effective programs teach urban environmental education as a lifelong process that emphasizes action.

Urban environmental education is a continuous process of personal and community change that is as relevant to preschoolers as it is to seniors. A strong action component helps make urban environmental education relevant to city dwellers. Young people are encouraged to take action, as this builds ownership, confidence, and ultimately, self-esteem.

With Training Student Organizers, students work together on projects of their own creation, something they see as meaningful to the school and the urban community. Their actions engender enthusiasm and commitment among them. As one TSO participant said, "My project was very exciting; I really liked the tabling events, when we talked to people on the street and handed out literature on conserving water and reducing, reusing, and recycling solid waste. If I were in charge of all school programs, I'd encourage students all over to try this."

NAAEE's *Guidelines for Urban Environmental Education* contain additional principles for high-quality environmental education in urban settings. While not directly pertaining to the formal K–12 arena and achieving the goals of education reform, we have found them to be important components of many effective programs. For more information on the *Guidelines,* see the recommended resources at the end of this article.

Urban Environmental Education at Its Best

Using the urban environment as a place for learning brings home many of the goals of education reform. Meaningful, constructivist learning opportunities abound, and a multi-disciplinary approach to problem-solving is essential.

All students can benefit from studying the diverse urban environment—not just those who live in cities. Learning about the urban environment, and relevant issues of equality, justice, and respect for other cultures and values, can build tolerance and understanding.

At its best, urban environmental education forges links between environmental issues such as natural habitat degradation or air pollution, and social, cultural, and economic issues such as housing or transportation. The potential for positive change within these linkages makes urban environmental education exciting. By engaging young people in developing their values and visions of a more sustainable future for cities—and encouraging them to act—we are surely doing our job as educators.

Emilio N. Williams, M.H.S., is President of the Koi Group and currently serves as Chair of the Urban and Multicultural Commission and on the Board of Directors of the North American Association for Environmental Education. He is also on the board of Adopt-A-Watershed.

Julian Agyeman, Ph.D., is Assistant Professor of Environmental Education at Pennsylvania Center for Environmental Education, Slippery Rock University of Pennsylvania. He is founder and co-editor of the international journal Local Environment *(www.carfax.co.uk/loe-ad.htm).*

PROGRAMS CITED

Training Student Organizers
Council on the Environment
of New York City
51 Chambers Street, Room 228
New York, NY 10007
(212) 788-7900
www.cenyc.org

The Summit Garden Project
Alliance for Education
500 Union Street, Suite 320
Seattle, WA 98101-2332
(206) 343-0449

Natural Connections,
VINE Project Site
Irvine Natural Science Center
8400 Greenspring Avenue
Stevenson, MD 21153
(410) 484-2413
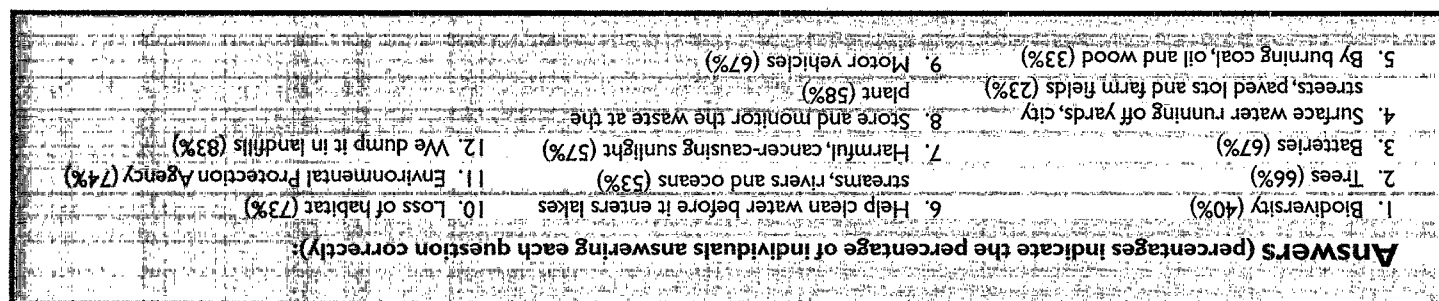**www.explorenature.org**

RECOMMENDED RESOURCES

Community Coalition for Environmental Justice. Provides links to environmental justice and multicultural issues including resources, bibliographies, government, community groups, speeches and talks about environmental justice, solutions and approaches and many others.
www.halcyon.com/ccej/EJlinks.html

Second Nature. A nonprofit organization working to help colleges and universities expand their efforts to make environmentally sustainable and just action a foundation of learning and practice.
www.2nature.org

The Koi Group. Select group of training professionals specializing in group facilitation, training, diversity/cultural competency, sustainability, staff and organization development. P.O. Box 305, Riverdale, MD 20738-0305
www.koigroup.com

"Guidelines for Urban Environmental Education," in *Environmental Education in the United States—Past, Present, and Future (Collected Papers of the 1996 National Environmental Education Summit, Burlingame, CA).* Sets forth ten guidelines for high-quality urban environmental education programs and offers concrete ideas for putting the guidelines into action. Published by the North American Association for Environmental Education.
www.naaee.org

Race, Poverty and the Environment. A journal co-published by the Urban Habitat Program and California Rural Legal Assistance. It gives voice to the growing movement for environmental justice. A special collaborative issue on multicultural environmental education is available. RPE/Earth Island Institute, Box 29908, Presidio Station, San Francisco, CA 94129-9908.

Answers (percentages indicate the percentage of individuals answering each question correctly)

1. Biodiversity (40%)
2. Trees (66%)
3. Batteries (67%)
4. Surface water running off yards, city streets, paved lots and farm fields (23%)
5. By burning coal, oil and wood (33%)
6. Help clean water before it enters lakes, streams, rivers and oceans (53%)
7. Harmful, cancer-causing sunlight (57%)
8. Store and monitor the waste at the plant (58%)
9. Motor vehicles (67%)
10. Loss of habitat (73%)
11. Environmental Protection Agency (74%)
12. We dump it in landfills (83%)

Test Your Environmental I.Q.

For the last seven years, the National Environmental Education and Training Foundation (NEETF) with Roper Starch Worldwide has studied the American public to determine what we know—and don't know—about the environment. According to the studies, students across the country clearly have intense interest in and concern about environmental quality. If teachers are to effectively respond to this interest, they, too, need to be environmentally literate. Yet, the 1997 survey shows that only one in three adult Americans has a passing understanding of our most pressing environmental issues.

How literate are you? Answer these 12 questions and test your environmental IQ. Answers are on page 30.

1. There are many different kinds of animals and plants, and they live in many different types of environments. What word is used to describe this idea?

   a) multiplicity   b) biodiversity   c) socio-economics
   d) evolution   e) don't know

2. Which of the following is a renewable resource?
   a) oil   b) iron ore   c) trees   d) coal
   e) don't know

3. Which of the following household materials is considered hazardous waste?

   a) plastic packaging   b) glass   c) batteries
   d) spoiled food   e) don't know

4. The most common major cause of pollution of streams, rivers and oceans is?

5. Most electricity in the United States is generated from what source of power?

6. The primary environmental benefit of wetland areas is?

7. Having ozone in the Earth's upper atmosphere protects us from?

8. The current solution to the disposal of most nuclear waste in the United States (i.e., what we do with it now) is?

9. What is the largest source of carbon monoxide in the U.S.?

10. What is the most common reason that animal species become extinct?

11. What is the name of the primary federal agency that works to protect the environment?

12. Where does most household garbage eventually end up once it leaves the home?

Note: These questions are quite similar to the actual survey questions used as part of the 1997 NEETF/Roper Starch Worldwide telephone survey of environmental attitudes, knowledge, and behaviors of adult Americans. The exact text of the questions (including the multiple choice answers for each) are not being circulated so that the questions can be used in coming years to gauge whether Americans are becoming more (or less) knowledgeable about the environment.

The 1998 NEETF survey results indicate that the public relies on outdated information to make decisions about the environment. For more information on NEETF research, contact: NEETF, 734 Fifteenth Street, NW, Suite 420, Washington, D.C. 20005, (202) 628-8200, (202) 628-8204 (fax), E-mail: neetf@neetf.org, Web site: *www.neetf.org*

A Little Salad Dressing Goes a Long Way

A group of students from Crenshaw High School in South Central Los Angeles has earned more than $124,000 in scholarships by selling salad dressing and organic produce. No, it's not one of those school fundraisers run by an outside company. These inner-city teens are student-owners of a natural food products company called "Food From the 'Hood." They created the company and manage it themselves, taking part in all the responsibilities associated with running the business: weeding and watering, developing and testing new products, bookkeeping, marketing, business planning, and even hiring and firing. They get welcome advice from teachers, community members, and entrepreneurs such as Norris Bernstein of Bernstein's Salad Dressing. They've even inspired visits from such varied notables as Ben Cohen, co-founder of Ben & Jerry's Ice Cream, and the Prince of Wales.

Company profits are distributed among the students according to points earned by working after school on company tasks, tutoring other students, taking the SAT, and participating in business-related seminars, all of which carry equal point value. When students graduate, they convert their points to company shares, and can apply their earnings to post-secondary education or vocational training.

Food From the 'Hood grew out of the 1992 riots sparked by the acquittal of four police officers charged in the videotaped beating of motorist Rodney King. The students wanted to help rebuild their battered community. So, with guidance from biology teacher Tammy Bird, they reclaimed a weed-infested quarter-acre plot behind the school's football field. Their initial goal was simple: to grow healthy food and give it to needy people in their neighborhood. But more than vegetables took root and an enterprising spirit and commitment to the community rose from the riots' ashes.

After learning about the importance of vision and long term planning, the students developed their mission statement:

- Create jobs for youth.
- Show that young people can and do make a difference.
- Prove that business can be socially responsible, environmentally friendly, and profitable.
- Give back to our community.
- Use this experience to prepare for the future.

"I knew these young people were on the right path the minute they developed their mission statement," said company advisor Melinda McMullen. "I told them that if other companies were as committed to their community, America might not be in such trouble right now."

In December 1992, Food From the 'Hood harvested its first crop and donated 100 percent of its produce to a local area food bank. In July 1993, the students attended their first public Farmers' Market, selling $150 worth of produce in 30 minutes and listening carefully when one of their customers suggested they should market their own label.

The following fall, Food From the 'Hood received financial support from RLA (formerly ReBuild Los Angeles) to develop a reproducible commercial product based on their homemade salad dressing. The students worked with a food technologist from Sweet Adelaide, a leading salad dressing co-packer. Six taste testings and reformulations later, "Straight Out 'the Garden" creamy Italian dressing was ready to hit market shelves.

Food From the 'Hood now has a second product, honey mustard dressing, and shelf space in more than 2,000 grocery stores in 23 states. They also have a licensing agreement with Food From the 'Hood East, students in Ithaca, New York, who have worked with Cornell University's food service testing facilities to develop three "Straight Out 'the Orchard" organic applesauces. The students are exploring sister programs in Chicago, San Francisco, Detroit, New York, Honolulu, Atlanta, and San Diego, and are seeking funding partners to document their curriculum and replicate the program in other communities.

Food From the 'Hood still donates 50 percent of its produce to local food banks. Half of the company's profits are put back into operating the company; the rest goes to funding scholarships. There have been 67 student-owners; all of the participating seniors have gone on to college or vocational training, as compared to less than half of the other students enrolled in the school.

"As a teacher, I was amazed to see the student-owners take such an interest in their company," said teacher and company advisor Tammy Bird. "Whether it was English, math, or science, they were willing to learn what they had to learn to create and manage a successful company. Food From the 'Hood has helped the kids apply what they are learning in the classroom—and more."

The first five student-owners are now graduating from college. It wasn't always an easy road; the students faced emotional challenges in their new, racially mixed surroundings, and some found themselves taking remedial classes and feeling cheated by the general quality of their inner-city high school education. But the benefits of their real-life experiences are clear: recent graduate Mark Sarria faced a skeptical interviewer who questioned that someone so young (21 years) could have the business acumen required for an available management position with a natural products broker. Needless to say, Sarria got the job.

As Executive Director Aleyne Larner puts it, "There's a special quality to what they're learning because it's transferable to real life."

For more information on Food From the 'Hood, contact the company at Crenshaw High School, 5010 Eleventh Avenue, Los Angeles, CA 90043, (888) 601-FOOD, fax (323) 295-4658. Web site: www.foodfromthehood.com

EEducator Survey

This is the first of a possible
continuing series of occasional
publications exploring issues
related to environmental education.

Your input on this survey will help
NAAEE determine whether to
continue to produce this type of
publication for teachers and other
environmental educators.

Please help us assess the usefulness
of this type of publication by com-
pleting and returning this survey to:

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To what degree...	NONE		SOME			HIGH	
Do you feel there is a need for a publication such as this?	1	2	3	4	5	6	NA
Would you like to see NAAEE continue to produce a publication such as this?	1	2	3	4	5	6	NA
Would you be interested in subscribing to a publication on environmental education and education in general?	1	2	3	4	5	6	NA
Should paid advertisements be used to help fund production of such a publication?	1	2	3	4	5	6	NA

Would you be interested in future issues on:

	NONE		SOME			HIGH	
EE and Service Learning	1	2	3	4	5	6	NA
EE and Multicultural Education	1	2	3	4	5	6	NA
EE and Bilingual Education	1	2	3	4	5	6	NA
EE in the Urban Setting	1	2	3	4	5	6	NA
EE and Preservice Education	1	2	3	4	5	6	NA
Criticism of Environmental Education	1	2	3	4	5	6	NA
EE and Multidisciplinary Education	1	2	3	4	5	6	NA
Other:_____	1	2	3	4	5	6	NA
Other:_____	1	2	3	4	5	6	NA

How often do you think a publication such as this should be produced?

❑ once per year   ❑ three times per year

❑ two times per year   ❑ four times per year

How much would you be willing to pay for such a publication?

❑ $3 per issue   ❑ $8 per issue

❑ $5 per issue   ❑ $10 per issue

Did this publication...

	NO		MAYBE			YES	
Deepen your understanding of environmental education?	1	2	3	4	5	6	NA
Deepen your understanding of education reform?	1	2	3	4	5	6	NA
Increase your understanding of how environmental education can help achieve education reform goals?	1	2	3	4	5	6	NA
Inspire you to use the environment as a theme in your classroom?	1	2	3	4	5	6	NA
Encourage you to incorporate reform trends in your non-formal education programs?	1	2	3	4	5	6	NA
Create an interest in reading future issues of a publication on environmental education issues?	1	2	3	4	5	6	NA

Check the articles that you actually read. To what degree did each article give you ideas or information that you will use within the next year?

	NONE		SOME			MANY	
☐ EDUCATION AND THE ENVIRONMENT: PARTNERS FOR CHANGE	1	2	3	4	5	6	NA
☐ A PRIMER ON EDUCATION REFORM	1	2	3	4	5	6	NA
☐ POWERFUL PEDAGOGY — USING EE TO ACHIEVE YOUR EDUCATION GOALS	1	2	3	4	5	6	NA
☐ EDUCATING FOR A MORE LIVABLE URBAN ENVIRONMENT	1	2	3	4	5	6	NA
☐ PREPARING TEACHERS FOR THE NEXT CENTURY	1	2	3	4	5	6	NA
☐ FROM THE INSIDE OUT: PROFESSIONAL DEVELOPMENT IN ENVIRONMENTAL EDUCATION	1	2	3	4	5	6	NA
☐ ACHIEVING STANDARDS THROUGH ENVIRONMENTAL EDUCATION	1	2	3	4	5	6	NA
☐ KNOWING WHAT WORKS: TRENDS IN EDUCATIONAL ASSESSMENT	1	2	3	4	5	6	NA
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What is your occupation (check all that apply):

- ☐ K–12 classroom teacher   If yes, grade(s)? _____ subject(s)? _____
- ☐ curriculum coordinator   If yes, grade(s)? _____ subject(s)? _____
- ☐ school administrator   If yes, grade(s)? _____
- ☐ nonformal educator   If yes, audience? _____

  check one: ☐ nature center   ☐ science center   ☐ museum   ☐ resource agency

  ☐ zoo   ☐ environmental organization   ☐ other

- ☐ preservice teacher educator (college or university)
- ☐ preschool teacher
- ☐ undergraduate or graduate student
- ☐ other (please specify) _____

Are you a member of the North American Association for Environmental Education?

☐ yes   ☐ no

Note: If you would like information on NAAEE membership, please return the coupon on page 39.

In which state or province do you live? _____

Additional comments or suggestions (please print clearly):

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Food From the 'Hood!

Preparing Teachers for the Next Century

by
Rosalyn
McKeown-Ice

"When I entered my teacher education program, I thought I was going to learn all about being a professional educator," says Patricia, a talented preservice teacher. *"After a while, I knew I would learn the basics, but realized there was a lot we just wouldn't be able to cover."*

Education reform efforts have called for changes in the initial preparation of teachers. However, change has been slow, primarily due to existing certification requirements that take up much of the prescribed course work. As a result, teacher-preparation faculty have little opportunity to teach non-mandated, but important, approaches to teaching and learning. If new teachers are to implement an interdisciplinary, student-centered curriculum, such as that promoted through environmental education, their training must provide experience in such methods.

Factors Shaping Preservice Teacher Education

Many factors shape preservice education programs. Most programs appear to strongly emphasize state teacher certification guidelines. Among other major influences are national and state tests for certification, the K–12 curriculum, professional guidelines, national and state trends, and the interests of education faculty.

When I visited a colleague at a small college in East Tennessee, I asked her what environmental education themes, strategies, and instruction methods she included in her block methods class. She shook her head and explained that the best she could do was to introduce the students to popular materials such as Project WILD and Project Learning Tree so that later in their careers they would know where to find environmentally-related lesson plans. She went on to explain that she had only three hours per week to teach science, social studies, and math methods and the skills mandated in the certification requirements; little time remained to try to work in effective environmental education strategies.

This story repeats across the nation. A national survey of teacher education institutions reveals that the number one barrier to including environmental education in the curriculum is too little time. In short, environmental education competes with mandated course content for time. The few institutions that offer environmental education usually do so because of the expertise and interest of one individual.

Current Status of Environmental Education in Teacher Education Programs

The University of Tennessee-Knoxville conducted a national survey regarding environmental education in 715 institutions of higher education that provide preservice teacher training. The results suggest a lack of attention to environmental education.

For example, the institutions were asked to rate their effectiveness in conveying environmental content knowledge, educating about environmental issues, conveying instructional methods related to environmental education, and conveying environmental action strategies. Most institutions rated themselves as poor or adequate, and less than 10 percent rated themselves as excellent in these areas (see Table 1). These low self-ratings are surprising given the current societal interest in learning about the environment.

Environmental education is most frequently incorporated into science methods classes. Generally, departments of education have not yet responded to the national trend to infuse environmental education into a variety of methods classes such as English, foreign language, math, music, or social studies.

Analysis of the survey data also indicates that a higher percentage of future elementary teachers than secondary teachers are exposed to environmental education. Almost all future elementary education teachers take science education methods, while only those secondary teachers who will specialize in science education (biology, chemistry, earth science, and physics) receive such preparation.

Aspects of Environmental Education in Preservice Programs

I asked a few colleagues what elements of environmental education realistically could be taught in a preservice curriculum. We know, for instance, that reading methods should not be abandoned to add environmental education to the elementary teacher-training curriculum. Together, we came up with a list of content, pedagogical methods, and skills described here. The list is not comprehensive, but reflects different professional opinions.

In general, preservice teachers receive training to teach with guided inquiry, constructivism, cooperative learning, discussions, mini-lectures, and critical thinking as part of a reformed teacher curriculum, and these are important to environmental education. Other methods central to environmental education include simulations, values clarification, and issues investigation. Of course, learning to conduct a field trip and take young people outdoors is also important.

There are countless supplemental instructional materials containing environmental simulations that can be integrated into virtually any discipline. In my own methods classes, I enjoyed using the activity "Oh Deer" from Project WILD (see box) to convey how to teach simulations. The experience involved the preservice teachers in content,

Table 1

Institutional Self-Evaluation Related to Teacher Preparation in Environmental Education

Effectiveness in:	Excellent	Good	Adequate	Poor
Conveying environmental content knowledge	6%	16%	33%	33%
Educating about environmental issues	2%	18%	36%	33%
Conveying instructional methods related to environmental education	5%	18%	32%	33%
Conveying environmental action strategies	1%	13%	27%	46%
Environmental education overall	1%	14%	35%	38%

methods, and classroom management, as well as in the joy of learning.

"Knowing how to teach environmental issues is one skill all preservice teachers need before entering the classroom," says Professor Ron Cleminson of the University of Memphis. "Our society faces a number of hot issues that ignite strong emotions. It's important to give a student teacher a way to handle those topics so the students hear different perspectives and understand the science underlying the issues."

Issues analysis, values clarification, and values analysis are techniques that can lead students to examine their own values and understand the motivation behind the positions and statements of other stakeholders. Southern Illinois University includes an issues-investigation class for all students seeking teacher certification. With guidance from

Oh Deer! "Oh Deer!" is one of more than 100 activities in the supplemental K–12 activity guide, *Project WILD*. The activity simulates the rise and fall of a deer population as available food, water, and shelter vary over 15 years. To begin, one-fourth of the class acts like deer, while the remaining students represent components of the habitat required for the deer to survive (food, water, and shelter). The teacher creates two lines, 10 to 20 yards apart, to set the playing field. The area behind one line is for the deer; the second area is for the habitat components.

In each round of play, the deer must search for one of the three habitat components. They signify which resource they need by putting their hands on their stomachs (for food), mouths (for water), or over their heads (for shelter). Using the same signals, students representing habitat components also choose to portray any of the three resources. The signals can be changed between, but not during, rounds.

To obtain their resources, deer must run to the habitat area, find a matching resource signal, and return with their resource to the deer area. To simulate the fact that adequate resources allow reproduction, any resource so taken becomes a deer in the next round. Any deer that fails to find its resource dies and becomes part of the habitat. The number of deer in each round (year) is recorded on a chart, then graphed, so students can see how populations fluctuate in response to resources.

To find out more about Project WILD, contact Project WILD, 707 Conservation Lane, Gaithersburg, MD 20878; web site: www.projectwild.org.

Professor Trudi Volk and her colleagues, the students select and research a broad range of social and environmental issues, such as the logging of endangered species habitat, the use of steroids to enhance athletic performance, or the availability of abortion. They learn to teach about issues in a way that does not allow emotional outburst or political alignment to derail the learning process.

Good education should include field trips—either in the school yard or off-premises. But safety, classroom management, and use of materials are all different in an outdoor setting. Specific skills and experiences are required to maximize the effectiveness of field studies. Many such techniques are simple—for example, positioning students so they face away from the sun when listening to instructions or using a buddy system on walks—but their impact is significant. Adding the excitement of the outdoors to a lesson can be overwhelming to both new teachers and students. For that reason, instruction in outdoor education techniques is essential both to learning and safety.

Beyond Science

"One of the founding documents of the environmental education field, the Tbilisi Declaration [see box], created increasingly sophisticated goals of environmental education dealing with awareness, knowledge, attitudes, skills, and participation," says Chuck Hopkins, former superintendent of curriculum with the Toronto Board of Education and long-time environmental educator. "Teachers should be able to instruct at each of these [awareness to participation] levels. They need to understand that environmental education is more than thematic teaching about the local ecosystem or the ecosystem of a rain forest in the Southern Hemisphere."

In addition, many educators and teacher educators believe that environmental education is the exclusive responsibility of the natural sciences. According to authors Harold Hungerford and R. Ben Peyton, "It is the social sciences in which the nuts and bolts of decision-making take place

Foundations of Environmental Education	Goals of Environmental Education	Objectives of Environmental Education
	• To foster clear awareness of and concern about economic, social, political, and ecological interdependence in urban and rural areas.	**Awareness:** To help social groups and individuals acquire an awareness of and sensitivity to the total environment and its allied problems.
The Belgrade Charter and the Tbilisi Declaration resulted from two United Nations conferences held in the 1970s. They established the following, still widely accepted, definition, goals and objectives for the field of environmental education.	• To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment.	**Knowledge:** To help social groups and individuals gain a variety of experiences in and acquire a basic understanding of the environment and its associated problems.
		Attitudes: To help social groups and individuals acquire a set of values and feelings of concern for the environment and motivation for actively participating in environmental improvement and protection.
Definition Environmental education is a process aimed at developing a world population that is aware of and concerned about the total environment and its associated problems, and which has the knowledge, attitudes, motivations, commitments, and skills to work individually and collectively toward solutions of current problems and the prevention of new ones."	• To create new patterns of behavior of individuals, groups, and society as a whole towards the environment.	**Skills:** To help social groups and individuals acquire the skills for identifying and solving environmental problems.
		Participation: To help provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems.

regardless of the amount of ecological knowledge that impinges on the problem or the solution to the problem." Professor Ruth Jacquot of Murray State University adds, "A preservice program should give new teachers an appreciation for the way environmental education can be integrated across the curriculum into music, art, language, math, and other disciplines. There ought to be an environmental education component to each methods and strategies class." She also contends that it is necessary to include an experiential component in preservice teacher education. "We cannot expect [new teachers] to teach something they have not done."

The North American Association for Environmental Education (NAAEE) is in the midst of drafting initial preparation guidelines for formal and non-formal educators. The guidelines list six themes important to an education professional: environmental literacy, foundations of environmental education, professional responsibilities of the environmental educator, planning and implementing environmental education programs, an environment for learning, and assessment. This set of guidelines is now undergoing nationwide review and will represent current national informed opinion.

One of the major points of the preparation guidelines is that environmental educators must themselves have some level of environmental literacy. That means they must have a working knowledge of the content and skills they teach, with mastery equal to the grade level they teach. (For more information, see the article on standards on page 48.)

Hands-on experience is as important to teachers as it is to students.

Another View

In some states, a number of requirements combine to squeeze all but "3R" essentials from the preservice curriculum. For example in Georgia, the sum of core university requirements (60 credits), student teaching (12 credits), and state certification requirements that include two 15-credit minors, is just 18 credits less than the maximum 120 credits required for graduation. This situation leaves little opportunity to teach basic methods and classroom management. A professor in a state that has heavy mandates confides, "We are struggling to keep a methods class in science and social studies."

Professor Susan Gannaway, chair of the department of education at North Georgia College and State University and director of the local water center, is a leading environmental educator in the Southeast. Despite her heavy involvement in environmental education, she does not envision environmental education being part of the preservice teacher education program at her institution. She sums up the state

> A national survey of teacher education institutions reveals that the number one barrier to including environmental education in the curriculum is too little time.

and university requirements with one phrase, "There's no room for it [environmental education] to happen."

She also expresses doubt about the readiness of preservice students to take on the challenge of outdoor education. After years of training and observing student teachers she admits, "It's hard to take kids outside and control them if you cannot do it inside." She goes on to suggest that because inservice teachers returning to higher education for graduate-level study normally have that ability, environmental education is more appropriate at the graduate level. Gannaway also has the courage to thoughtfully question mainstream thinking. "Another issue here is that environmental education is an integrative field," she says. "It is hard to teach integrative methods to students without a solid base. That is one reason why I am in favor of environmental education at the graduate level."

She points out that a logical way to ensure that teachers have training in environmental education is to require it in the state re-certification process. For example, a state could require an environmental education course for professionals seeking re-certification in elementary grades or in middle-grades social studies and science. With this requirement, experienced teaching staff would be competent in environmental education.

A Time of Opportunity

Despite the concerns expressed by Gannaway and others, environmental education is an excellent vehicle for many of the strategies recommended to achieve education reform. (See primer on page 14.) As schools restructure in response to pressure for reform, we find ourselves in a "teachable moment" for both preservice and inservice teachers.

Valuable graduate and inservice programs are readily available for inservice teachers (see page 40). However, many teacher educators say that it is easier to introduce teachers at the preservice level to environmental education than those at the inservice level. Preservice teachers are building their curricula and are open to new lesson plans and new approaches to teaching. Once teachers have been in the classroom for several years, their curricula and methods of teaching often become ingrained and less open to modification or revision. As a result, it is easier and probably more cost-effective to train preservice teachers in state-of-the-art practices rather than to re-train inservice teachers.

Clearly much work remains to be done to develop environmental education in the preservice arena. Between 1995 and 2005, a third of all teachers will be new to the profession, as retirements and increasing enrollments open many teaching positions across the country. The large number of new hires gives the environmental education community an opportunity to train thousands of educators to teach effectively about the environment—an opportunity we should seize.

A Programmatic Gem

Although it is next to impossible to find a preservice program that excels in preparing new teachers in environmental education, quality classes taught by individual professors exist in institutions across the United States. One such class is "Life Science for Elementary Education Majors" taught by Professor Cindi Smith-Walters at Middle Tennessee State University. The class is offered through the Biology Department for upper division students.

Smith-Walters's class is a unique blend of content, pedagogy, resources, and activities, all with direct application to the elementary or middle school classroom. The students come in with a good understanding of biology, child development, and basic pedagogical skills. This frees Smith-Walters to link life science and environmental content to classroom activities and to expose her students to a wide variety of teaching materials and resources.

Each major topic presented in lecture is accompanied by activities that augment it. For example, when Smith-Walters teaches the concept of population, two hands-on activities—"Bean Bugs" from Outdoor Biological Instructional Strategies and "Critter Counting" from Activities in Math and Science—accompany her lecture.

Both activities are from supplemental curriculum materials developed by the Lawrence Hall of Science in Berkeley, California. Her students also receive training in four national environmental education programs: Project WILD, Aquatic WILD, Project Learning Tree, and Project WET (for contact information, see page 45), and attend Tennessee Environmental Education Association and Tennessee Science Teacher Association meetings.

Smith-Walters's students make notebooks of classroom activities and fill a resource box with teaching materials accumulated during the semester. Former students comment that they repeatedly use the resources and activities in their classrooms.

NAAEE has recently published a *Directory of Faculty Who Teach "Environmental Education" Courses at Colleges and Universities in the United States*, listed in the references on page 39. Prepared for NAAEE by Michaela Zint, with Margaret Larson, Ana Lydia Rodriguez, and Anna-Marie Fitch, this directory is a useful tool for both students and faculty trying to locate information about environmental education training in higher education programs.

For more information on Lawrence Hall of Science publications call (510) 642-1016, or visit the web site:
www.lhs.berkeley.edu/

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Rosalyn McKeown-Ice, Ph.D., directs the Center for Geography and Environmental Education at the University of Tennessee-Knoxville. Her current research focuses on assessing environmental literacy.

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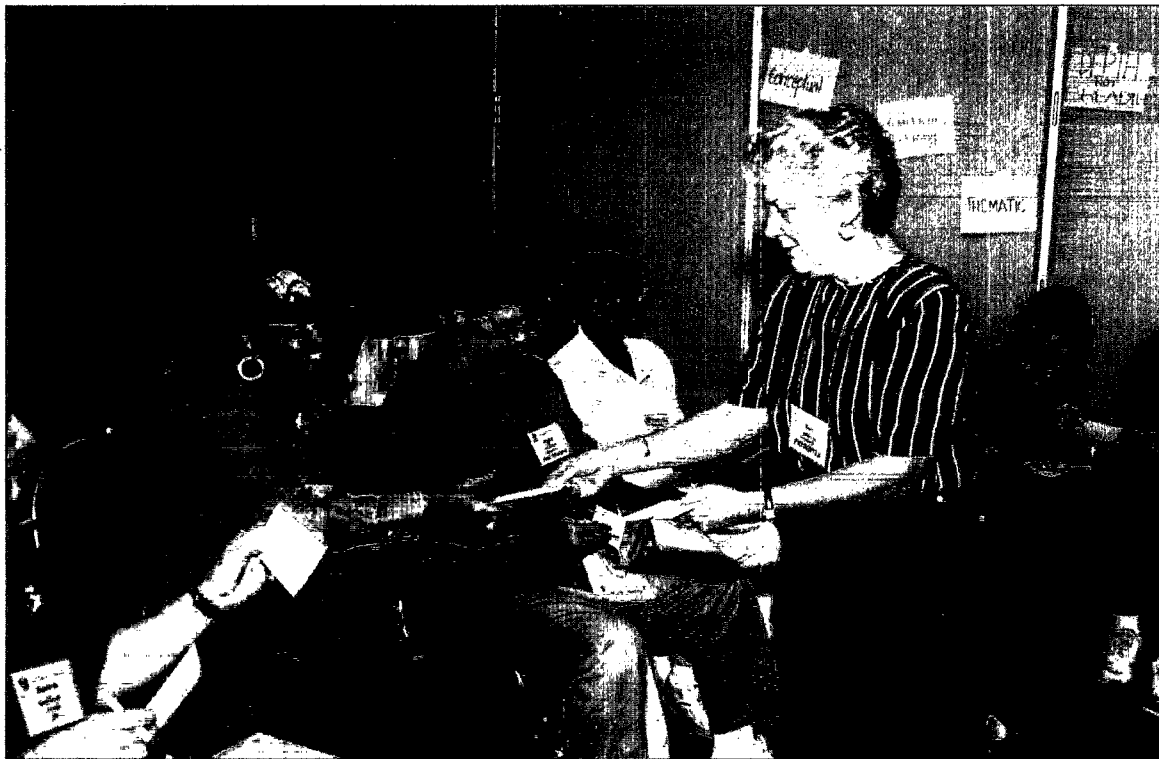☐ The VINE Network
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Teachers participating in a Project Learning Tree inservice workshop.

From the Inside Out: Professional Development in Environmental Education

by Joanne M. Glenn

T he students leave tables that are covered with newsprint, egg cartons, and milk jugs that hold remnants of their experiments, and form a circle in the hall. One student states something she learned, then throws a ball to another, inviting him to do likewise.

These students are classroom teachers who have spent the day at a training on how to teach a resource conservation unit. They have been practicing for themselves what school reform goals say they must teach children to do: investigate, inquire, experiment, and collaborate. These teachers are learning from the inside out.

Like other workshops of its kind, this environmental education training offered concrete learning applications, opportunities for reflection, and feedback from skilled trainers—all hallmarks of good professional development.[1] As reform-minded educators look for a new vision of teaching in which "professional development activities are understood to be as vital to learning as classroom instruction,"[2] environmental education trainings such as this are becoming more important. The challenge is organizing environmental education training so that it reaches teachers, improves student achievement, and widens the lens on environmental education as more than just a collection of activities saved for Earth Day.

The Issues

Bora Simmons, a professor at Northern Illinois University, says the most cost-effective professional development strategy would be to target preservice teachers and demonstrate how to teach using environmental education topics, especially since so many teachers will retire in the next decade. Yet, while effective preservice preparation in environmental education is of critical value, it cannot be the only way of learning to implement environmental education. Many practicing teachers and nonformal educators (such as those who teach in nature centers) have little or no environmental education preparation in their undergraduate course work. A strong system of comprehensive, in-depth preparation for inservice teachers is equally important. Simmons says that instead of encountering environmental education in

their preservice training, "most teachers learn of environmental education through word of mouth, or by attending conferences—or through something like *Project WILD*, a nationally-disseminated curriculum supplement, at a district inservice."

In general, Simmons says, formal educators are strong in pedagogy but weak in science content. Nonformal educators often come into environmental education strong in one of the sciences but without having had the opportunity to learn about teaching and learning.

Environmental education inservice targets both concerns. "If you look at the pieces of education reform—higher-order thinking skills, different learning styles, Gardner's work on multiple intelligences, and learning that is relevant to the child—so much in environmental education is compatible," says Simmons. Yet "there's still a need for a comprehensive look at what environmental education is, and how it can be sequenced to develop knowledge, skills, and action." Simmons is working with the National Project for Excellence in Environmental Education to identify high-quality environmental education practices. Out of that will come recommendations for the preparation and continuing education of teachers and other environmental educators.

Environmental Education Training: Not for Science Teachers Only

Perhaps the most well-known professional development programs in environmental education are the "Projects": *Project Learning Tree, Project WET, Project WILD*, and *Project WILD Aquatic*. Each program features hands-on workshops plus a take-away manual of activities with background information, teaching tools that support education reform, and other resources.

"'Project' activities can be a catalyst for integrating curriculum areas," says Marylin Lisowski, professor of education at Eastern Illinois University. That's a good first step for teachers nervous about teaching science. The activity "The Long Haul" from *Project WET*, for example, taps math, geography, social studies, and language arts to explore socio-cultural impacts of water use and abuse (see box).

Christy Trutter, environmental protection specialist at the Illinois EPA, understands teachers' trepidation, so she advertises her workshops as "not for science teachers only." Trutter created the "Watershed Meisters and Mentors Program" with her state board of education. The program teams teachers and EPA officials in partnerships that provide water monitoring training and data to the EPA for water quality reports. Other environmental education

"The Long Haul"

"The Long Haul" is one of more than 90 activities in the Project WET Curriculum and Activity Guide. The activity is intended to help students develop an appreciation of today's readily available water supplies, and increase their understanding of how easy access to water can encourage people to use large amounts.

The class is divided into two teams. Using buckets, their task is to haul enough water from a source (a stream, pond, or water spigot) to fill a garbage can 150 feet away. Students predict the number of trips and the time they think it will take to fill the can. Then, the activity, run as relay race, ensues.

In follow up to the race, students compare their predictions to their actual results, use math to calculate the size of the trash can and other containers, and discuss ways people in the past used water. Emphasis is placed on how having to haul water for household use would affect water use. Students design skits or murals conveying the advantages and disadvantages of readily available water.

For more information on Project WET, see the box on selected resources on page 45.

training providers have created topic-specific advanced workshops that bring in experts such as biologists and foresters to give teachers the content they want.

Even the most enthusiastic graduates of environmental education inservice workshops will find it difficult to sustain their commitment to problem-based teaching without some support mechanism, says Simmons. The obstacles—scheduling, resources, and resistance from other teachers—can seem too great. Even teachers who've managed to get their colleagues' support say it took three to four years to win them over. For this reason, professional development models that are long-term and provide ongoing support are critical.

"What's been successful is sending teams of teachers from the same school to a longer (usually one to two weeks) training session and having the administrator attend one or two days," Simmons says. "An even more powerful model is to have teachers meet sometime during the first semester, regroup, and report successes and failures."

This type of long-term support allows teachers to reflect, she explains, and to refresh by seeing what other teachers are doing. Programs such as the California Schools Implementation Network, a part of the California K–12 Alliance, and the model schools projects in the states of Washington and Florida work with entire schools in this fashion, engaging teachers in professional development over a sustained period and offering lots of choices about what teachers do with their curriculum. Simmons believes this is the kind of work that needs to be done if there is going to be long-term change.

How Environmental Education Training Changes Teachers

Does environmental education training change teachers in ways consistent with school reform goals? Lisowski, who follows up the programs her department offers, answers an unqualified yes.

She sees teachers using inquiry-oriented strategies such as case studies, outdoor observation, simulations, games, and experiments. If done well, teachers may "throw away the textbook" as their students use real-world resources to study community-based environmental issues.
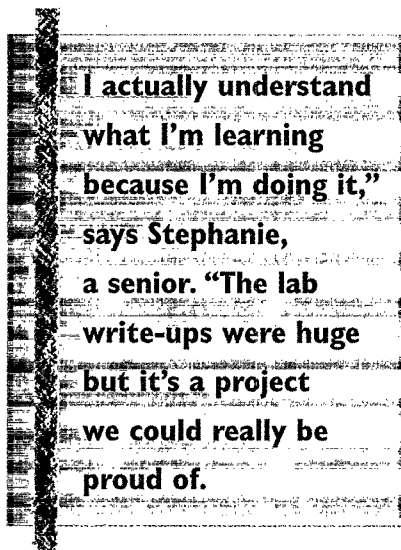
Ron Hellstern, a ninth-grade teacher at South Cache Freshman Center in Hyrum, Utah, says conferences spurred him to change his teaching. "A conference is a motivational hypodermic needle," Hellstern says. "I pull a blue-ribbon idea from each program."

Hellstern's successful use of these ideas earned him

> "I actually understand what I'm learning because I'm doing it," says Stephanie, a senior. "The lab write-ups were huge but it's a project we could really be proud of.
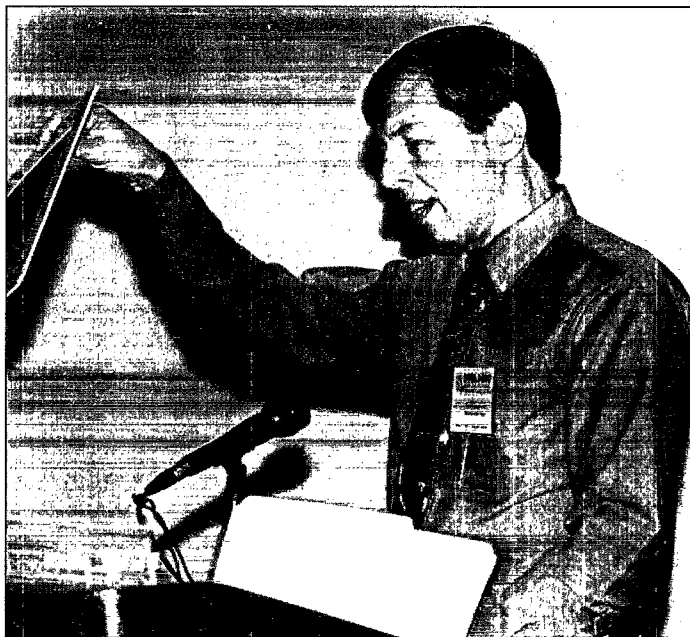
statewide recognition and a *Project Learning Tree* "Teacher of the Year" award. "I used to be a 'Where's Waldo' type of teacher: having students read the book, find the answers, and take the test," he says. Now his students do self-directed learning. For example, Hellstern lists on an overhead transparency Utah's ninth grade earth systems standards. Then he asks students what they think the standards mean, what they know about the topics, and what they need to know. Hellstern's students generate questions, which he then records and distributes to his classes. Students assume responsibility for discovering answers, using any resources at their disposal. Once they are immersed in the topic, students must generate lessons dealing with the topic's scientific principles (for example, water surface tension) and teach other students.

As successful as his methods are, Hellstern admits this approach can engender instructional problems: setting up the learning situation is a lot of work, and placing the burden of learning on the student involves lots of trust. It is also difficult for both the teacher and students to shift the teacher's role from content expert to knowledge facilitator.

The shift creates a paradox, says Bill Donato, a teacher at Woodstock High School in Woodstock, Illinois. "Teachers need knowledge. They also need the ability to feel comfortable not knowing everything," he says. Donato adopted problem-based instruction after he participated in pro-

Ron Hellstern, 1997 PLT National Teacher of the Year

Bill Donato and students explore the catch from a seine net.

Student Learning Outcomes

Do students whose teachers use environmental education-based strategies learn more? There is a common sense among teachers that they do, though hard data are still forthcoming. One reason for the lack of data may be the novelty of how outcomes are measured. Bill Ehmann of the environmental science program at Drake University in Des Moines, Iowa, explains: "Schools are looking at corporate models for assessment, trying to track outcomes," he says. "The data gathering is not really standardized yet because it's a new field and the technique is new to academics." Simmons senses that things are extremely positive: teachers are being successful, students are achieving—whether or not that achievement shows up on standardized tests.

One educator's experience with a third-grade class tells the story: after demonstrating a model of nonpoint source pollution, Christy Trutter took students down to the river to make the model real. "I had just started explaining," she says, "and this third grade boy interrupted me. His hand waved in the air, words bubbling out with the exact idea—he got it! I told him 'That's great, a very good observation.' The other kids needed more information to take the model further. Later as the kids ran ahead to the next activity, his teacher told me, 'I am just so proud of him! You know, he's generally not one of my better students.'"

A Literacy of Learning

Giving students a way to make those connections is at the heart of education reform. For environmental education to be more than just a collection of Earth Day activities, teachers will need to make those connections, too.

Some workshop facilitators borrow from other disciplines to make learning about environmental education as integrative for teachers as it is for students. Hellstern, for example, uses a technique naturalist Aldo Leopold used. He asks teachers to reflect and write about what they learn and how they'll apply it in their classroom. This premise of teacher-researcher (a model long endorsed by the National Writing Project in Berkeley, California) promotes literacy about the learning process.

Literacy is also the lynchpin of environmental education professional development: What is environmental literacy? How do environmentally literate citizens conduct their lives? What do teachers who wish to create environmentally literate students need to know and be able to do?

The National Project for Excellence in Environmental Education is using critique, collaborative inquiry, and consensus to develop guidelines for effective environmental education. The Project will address curriculum design, student diversity, educational policies, student assessment, and, of course, teaching strategies and professional development.

Developing guidelines for preparing environmentally literate citizens is a first step toward organizing the deep

grams such as *Project WET, Project Planet,* and *EcoWatch.* As a result of their own water monitoring projects, his students provide data to the U.S. Fish and Wildlife Service.

"Problem-based instruction is a more holistic way of learning and teaching," Donato says. Echoing Hellstern, Donato says that learning becomes more authentic. His students concur.

"I actually understand what I'm learning because I'm doing it," says Stephanie, a senior. "The lab write-ups were huge but it's a project we could really be proud of."

Students and teachers with whom educator Susie Harpham works know that sense of pride. Harpham directs Eco-Educators, a non-profit organization based in Columbus, Ohio, that trains students and teachers in environmental concepts. Describing a three-year pilot in which 30 middle-school students conducted waste audits in businesses and then presented recommendations for cost savings through better waste management practices, Harpham says, "Kids get lots of responsibility. Teachers find they love the activities. They see students getting a number of things in one class: science, math, and writing skills." At the end of the year, Harpham says, teachers convinced their supervisors to revise schedules to accommodate longer sessions more conducive to environmental education's integrated approach.

and flexible understanding of content needed to make this learning authentic—for environmental education teachers as well as their students. As more data about the effectiveness of environmental education strategies are collected, the challenge of organizing appropriate environmental education training for teachers may become less daunting, and the opportunities for achieving compatible goals of school reform more accessible.

REFERENCES

1 American Psychological Association. "Bringing to Scale Educational Innovation and School Reform: Partnerships in Urban Education." Washington, D.C. : American Psychological Association Conference Proceedings, 1997.

2 National Center for Research on Teacher Learning. "Learning to Walk the Reform Talk: A Framework for the Professional Development of Teachers." College of Education, Michigan State University, East Lansing, MI, 1995.

Joanne M. Glenn is an independent writer and educator based in Woodbridge, Virginia, who specializes in education and healthcare. Drawing on her experience as a teacher, editor, and association management professional, Glenn also develops and delivers presentations for businesses and universities .

Environmental Education Infusion: Where to Start

- Experiment with programs that lend you a mentor, such as those sponsored by Departments of Natural Resources or the EPA. Let the mentor model the activities.

- Take a workshop. Use the activities from the workshop in your classroom.

- Join your state environmental education organization.

- Check out the home pages for environmental education organizations and training providers. Get ideas from other educators who are using environmental education in their classrooms.

- Remember that change happens one teacher at a time. Invite a colleague to accompany your class on an environmental education expedition. (Pretty soon the two of you will be collaborating on lessons.)

- Extend your reach by taking more in-depth training. Bora Simmons of Northern Illinois University suggests these questions to select the best option:

  - ✔ Does this workshop or series of workshops provide a general overview of environmental education?

  - ✔ To what extent is this workshop giving you ideas and skills for integrating environmental education into and really changing your curriculum?

  - ✔ Does the workshop offer help in how to develop a long-term thematic unit or year-long program?

  - ✔ To what extent can this workshop help your school infuse environmental education into its entire curriculum?

  - ✔ Are workshop facilitators providing more than just content, for example, demonstrating constructivist perspectives and good pedagogy? Is there help on integrating content and processing skills?

SELECTED RESOURCES

WHERE TO FIND INFORMATION ON ENVIRONMENTAL EDUCATION TRAINING PROGRAMS

Many environmental education programs are free to participants. According to Marylin Lisowski, Eastern Illinois University, most states have developed correlation guides that prove standards are covered in the teaching of environmental education, giving teachers "legal leverage" to use this approach in their classrooms.

NATIONAL LEVEL TRAINING PROGRAMS

The Environmental Education and Training Partnership (EETAP) web site provides an easy link to training information and a variety of resources. **www.eetap.org**

Autodesk Foundation. Project-based learning information and training, including annual conference. **www.autodesk.com/foundation**

EdGateway. National, state, and local calendars of events, environmental education discussion groups, links to individual and group e-mail addresses. **www.edgateway.net**

EE Link. Provides links to environmental education resources, materials, organizations, projects, events calendars, grants, and job listings on the web. **http://eelink.net**

Eisenhower Mathematics and Science Education Regional Consortia and Clearinghouse. Resources and research, model practices, links to the ten U.S. Department of Education-sponsored Regional Educational Laboratories. **www.enc.org**

North American Association for Environmental Education (NAAEE). Offers professional development opportunities: Environmental Issues Forums (EIF); Volunteer-led Investigations of Neighborhood Ecology (VINE); annual conference; and the Environmental Education and Training Partnership (EETAP). (202) 884-8912; **www.naaee.org**

Northern Illinois University National Project for Excellence in Environmental Education. Contact Bora Simmons. Guidelines for environmental education materials, K–12 learners, initial preparation of environmental educators. (815) 753-0205; **www.naaee.org**

Project Learning Tree. Internet home page gives overview of project and supplemental curriculum materials. Also provides contact information for state coordinators and calendars of upcoming workshops. (202) 463-2700; **www.plt.org**

Project WET: Water Education for Teachers. Internet home page gives overview of project and supplemental curriculum materials. Also provides contact information for state coordinators and calendars of upcoming workshops. (406) 994-5392; **www.montana.edu/wwwwet/**

Project WILD/Project WILD Aquatic. Internet home page gives overview of project and supplemental curriculum materials. Also provides contact information for state coordinators and calendars of upcoming workshops. (301) 527-8900; **www.projectwild.org**

U.S. EPA Office of Environmental Education. Includes information on training activities that OEE funds through EETAP with other federal agencies. **www.epa.gov/enviroed**

OTHER TRAINING PROVIDERS (LOCAL OR REGIONAL)

California Schools Implementation Network. Provides school staffs with planning, content instruction, and pedagogy to improve science at member elementary schools. (714) 824-8456; **www.fwl.org/seaba/96journal/csin.html**

Community Organizations: nature centers, environmental education centers, parks, museums

County or City Offices: Education, Solid Waste Management; Soil and Water Conservation District; University Extension. Often have education staff.

Eco-Educators. Provides environmental education to schools and nonprofit organizations. (614) 487-9522; e-mail GGOHIO@aol.com

Second Nature: Training programs and access to educational resources for environmental education at institutions of higher learning. (617) 292-7771; **www.2nature.org/**

State Boards/Departments of Education. Usually maintain calendars of upcoming workshops, including environmental education training. Teachers interested in connecting classrooms with the business world may find opportunities in "School to Work" and "Service Learning" programs.

State Departments of Natural Resources, Environmental Protection Agencies, or Fish and Wildlife Services. Examples of programs include watershed workshops, fire ecology, fishery sampling, caves, etc. Ask for the Education Coordinator.

State Environmental Education or Outdoor Education Associations

Universities and Colleges: Departments of Education, Natural Resources, Outdoor Recreation.

Wisconsin: A Model of Success

PROGRAM PROFILE

BY KENDRA KUROSAWA

The roots of Wisconsin's exemplary environmental education program go back to the early 1930s, when a forward-thinking conservationist, Wilhelmina Diefenthaler LaBudde, co-founded the Wisconsin Association for Conservation Education (WACE). LaBudde and her colleagues collaborated with teachers and school administrators to bring environmental education into the classroom. LaBudde was a driving force behind Wisconsin's first Environmental Education Statute, a groundbreaking 1935 law mandating common school instruction in conservation principles and corresponding training for any science or social studies teacher seeking certification.

Like its predecessor, the current version of the Wisconsin Conservation Education Statute has served as a model for other similar statutes across the U.S. It focuses on training for early childhood, elementary school, agriculture, science, and social studies teachers in a variety of areas from ecological principles to building citizen participation skills. The statute became the basis for other Wisconsin initiatives, including a grants program, a state environmental education center and board, and a curriculum planning requirement.

Today Wisconsin is a leader in promoting environmental literacy among both teachers and students. The following are some of the components of Wisconsin's comprehensive environmental education program:

Teacher Certification Requirement: All candidates receiving first-time certification must demonstrate competency in seven areas: natural resources and their conservation, ecological principles, biological and physical energy systems, people-environment interactions, affective education methods, cognitive education methods, and building citizen participation skills.

K–12 Curriculum Planning: Every school board in Wisconsin's twenty school districts must develop a written sequential curriculum plan in reading, language arts, mathematics, social studies, science, health, computer literacy, environmental education, vocational education, physical education, art, and music. Plans must specify objectives, course content, resources, and program evaluation methods. The penalty for non-compliance may be the loss of 25% of the school's annual aid package from the state.

Environmental Studies Major and Minor Standards: The Wisconsin Department of Public Instruction (DPI) has approved standards for a certifiable major and minor in environmental education. Teachers in grades 1–8 must complete an academic minor in any subject area, with environmental education as an option. Teachers desiring to teach environmental studies as a subject area in grades 9–12 must complete a major or minor in environmental education.

Wisconsin Environmental Education Board: The Wisconsin Environmental Education Board (WEEB) was created under Wisconsin's 1990 Environmental Education Act to identify needs and priorities for environmental education in the state. The fifteen-member board is composed of representatives of government agencies such as the Wisconsin Department of Natural Resources (DNR) and the Wisconsin DPI, as well as representatives of the state legislature, environmental education, environmental organizations, the business sector, and the University of Wisconsin system.

The State Environmental Education Grants Program: WEEB administers a state allocation of $200,000 each year to be awarded as matching grants "for the development, dissemination, and presentation of environmental education programs." Public agencies—including school districts, towns, cities, and counties—and non-profit corporations are eligible to receive these grants. WEEB's Development Committee is responsible for soliciting additional contributions from the private sector as well as fostering partnerships between the private and public sectors to support environmental education goals.

The Wisconsin Center for Environmental Education: The Wisconsin Center for Environmental Education (WCEE) was established by the state's 1990 Environmental Education Act to assist environmental education teachers throughout the state. The WCEE provides inservice courses for K—12 teachers; offers an Extended Masters degree in Natural Resources for teachers through the University of Wisconsin-Stevens Point; assists the DPI in the periodic assessment of environmental literacy of students and teachers; maintains a curriculum resource library for educators at all levels; manages the Wisconsin School System Environmental Education Network; consults with school districts, teachers, and institutions of higher education to improve environmental education curricula; sponsors an annual Teacher/Student Environmental Action Leadership Conference; and works with the DPI to develop an environmental education needs assessment program for school districts.

Environmental Literacy Assessment: The 1990 Environmental Education Act also requires that the environmental literacy of Wisconsin's students and teachers be assessed periodically. Wisconsin is the only state to require this by law.

The State Environmental Education Consultant: As part of the DPI, the State Environmental Education Consultant is charged with helping schools, universities, and colleges meet the state environmental education requirements. The consultant's responsibilities include creating curriculum guides for districts and interfacing with other agencies to support environmental education programs.

The Wisconsin Association for Environmental Education: The Wisconsin Association for Environmental Education (WAEE) is a private, non-profit professional organization composed of over 1,000 teachers, university students, and environmental professionals, as well as organizations such as school districts and environmental groups. The WAEE holds conferences and workshops, publishes a

The Regional Educational Laboratories

PROGRAM PROFILE

The ten Regional Educational Laboratories funded by the U.S. Department of Education comprise a research and development network dedicated to solving the nation's most persistent education problems. Each lab is staffed with skilled professionals who work in partnership with members of their region's educational community to design and implement programs to improve teaching and learning in their region. Unlike many university-based research centers that focus on long-term, complex issues, the Regional Educational Laboratories favor an approach that is practical and direct — the Laboratories are capable of responding quickly to time-sensitive situations and policy issues.

The relationship that is formed between the educators and researchers is a symbiotic one. Research & Development activities are strongly influenced by the recommendations of teachers, parents, administrators, and policymakers who are on the front lines of education. As practitioners help design projects and test teaching models, researchers learn about how to best apply research-based knowledge in the field. The products of these collaborations—including research summaries, how-to manuals, audio cassettes, and videotapes—are available through the Laboratories, each of which has at least one designated specialty area.

The Regional Educational Laboratories channel tens of millions of funding dollars into well over a thousand research projects each year. Many of these projects are relevant to environmental education. Contact the Educational Laboratory in your region to find out about its publications, workshops, training programs, on-line conferences, information and referral services, and research opportunities.

All ten Regional Educational Laboratories can be accessed on the web at www.nwrel.org/national/

Appalachia Educational Laboratory (AEL)
1031 Quarrier Street
PO Box 1348
Charleston, WV 25325
(304) 347-0400 or (800) 624-9120
Specialty Area: Rural Education

Lab at Brown University Education
    Alliance (LAB)
222 Richmond Street, Suite 300
Providence, RI 02903
(401) 274-9548 or (800) 521-9550
*Specialty Area: Language and Cultural
    Diversity*

The Laboratory for Student Success (LSS)
933 Ritter Annex
13th and Cecil B. Moore
Philadelphia, PA 19122
(214) 204-3001
Specialty Area: Urban Education

Mid-Continent Regional Educational
    Laboratory (McREL)
2550 S. Parker Road, Suite 500
Aurora, CO 80014
(303) 337-0990
*Specialty Area: Curriculum, Learning, and
    Instruction*

North Central Regional Educational
    Laboratory (NCREL)
1900 Spring Road, Suite 300
Oak Brook, IL 60521
(630) 571-4700
Specialty Area: Technology

Northwest Regional Educational
    Laboratory (NWREL)
101 SW Main Street, Suite 500
Portland, OR 97204
(503) 275-9500 or (800) 547-6339
Specialty Area: School Change Processes

Pacific Resources for Education &
    Learning (PREL)
1099 Alakea Street, Suite 2500
Honolulu, HI 96813
(808) 533-6000
*Specialty Area: Language and Cultural
    Diversity*

SouthEastern Regional Vision for
    Education (SERVE)
PO Box 5367
Greensboro, NC 27435
(910) 334-3211 or (800) 755-3277
Specialty Area: Early Childhood Education

Southwest Educational Development
    Laboratory (SEDL)
211 East Seventh Street
Austin, TX 78701
(512) 476-6861
*Specialty Area: Language and Cultural
    Diversity*

WestEd
730 Harrison Street
San Francisco, CA 94107
(415) 565-3000
*Specialty Area: Assessment and
    Accountability*

Wisconsin, continued

quarterly newsletter, and sponsors an awards program recognizing individuals who have made outstanding contributions to the field of environmental education.

Publications: Two Wisconsin government-sponsored publications are readily available to environmental educators. *A Guide to Curriculum Planning in Environmental Education* (1985), published by the Wisconsin DPI, discusses how environmental education can be integrated into the broader curriculum by examining the subject from goals and theory to implementation and evaluation techniques. The guide has served as a model for similar documents in four other states and 41 nations around the world. The *EE News* quarterly newsletter, a joint publication of Wisconsin's DNR, DPI, and local environmental education organizations, covers environmental issues, teaching activities, resources, and workshops. The newsletter reaches over 5,000 educators throughout the state and nationwide.

Kendra Kurosawa is a freelance writer in the San Francisco Bay Area. Exploring the world is part of her current curriculum.

Achieving Standards through Environmental Education

by Mike Kaspar

n North Carolina, sixth graders are expected to summarize, analyze, and evaluate different types of fiction and nonfiction literature. In Delaware, fifth graders have to construct, examine, and extend the meaning of various texts; they must read a full-length passage from a text, and answer questions with both brief and detailed responses. What do these activities from two different states hold in common? The answer is "standards."

The push for standards-based teaching is perhaps the most visible component of current efforts to improve the nation's schools. Upset by tests showing that American student performance falls far short of student performance in other countries, the National Council of Governors, businesses, universities, and parents called for the adoption of tough standards to ensure that the United States retains its place in the global economy.

State governments are solely responsible for determining what is taught in U.S. schools, defining what students are expected to know and to be able to do at various steps along the way to high school graduation. We have no national curriculum and, in the past, there has not been a significant push for national standards in education reform movements. So why have national standards come to play such a key role in recent years?

In 1992, University of Wisconsin-Madison professor Michael Apple speculated that, "Education in general has increasingly become dominated by economic interests." His subsequent commentary led him to conclude that business is the power base of the current reform movement. In 1995, Margaret Cozzens of the National Science Foundation corroborated his speculation and wrote, "With increasing tech-nological skills needed in the workplace, it becomes more necessary to reform mathematics, science, and technology education in order to prepare today's students for the workforce of tomorrow."

Professional organizations such as the National Council of Teachers of Mathematics, the Center for Civic Education, the National Academy of Science, and The National Council for Geographic Education responded by developing standards or guidelines for learning in their respective disciplines. These standards are intended to be an important tool for properly preparing students to be effective citizens and workers in the 21st century.
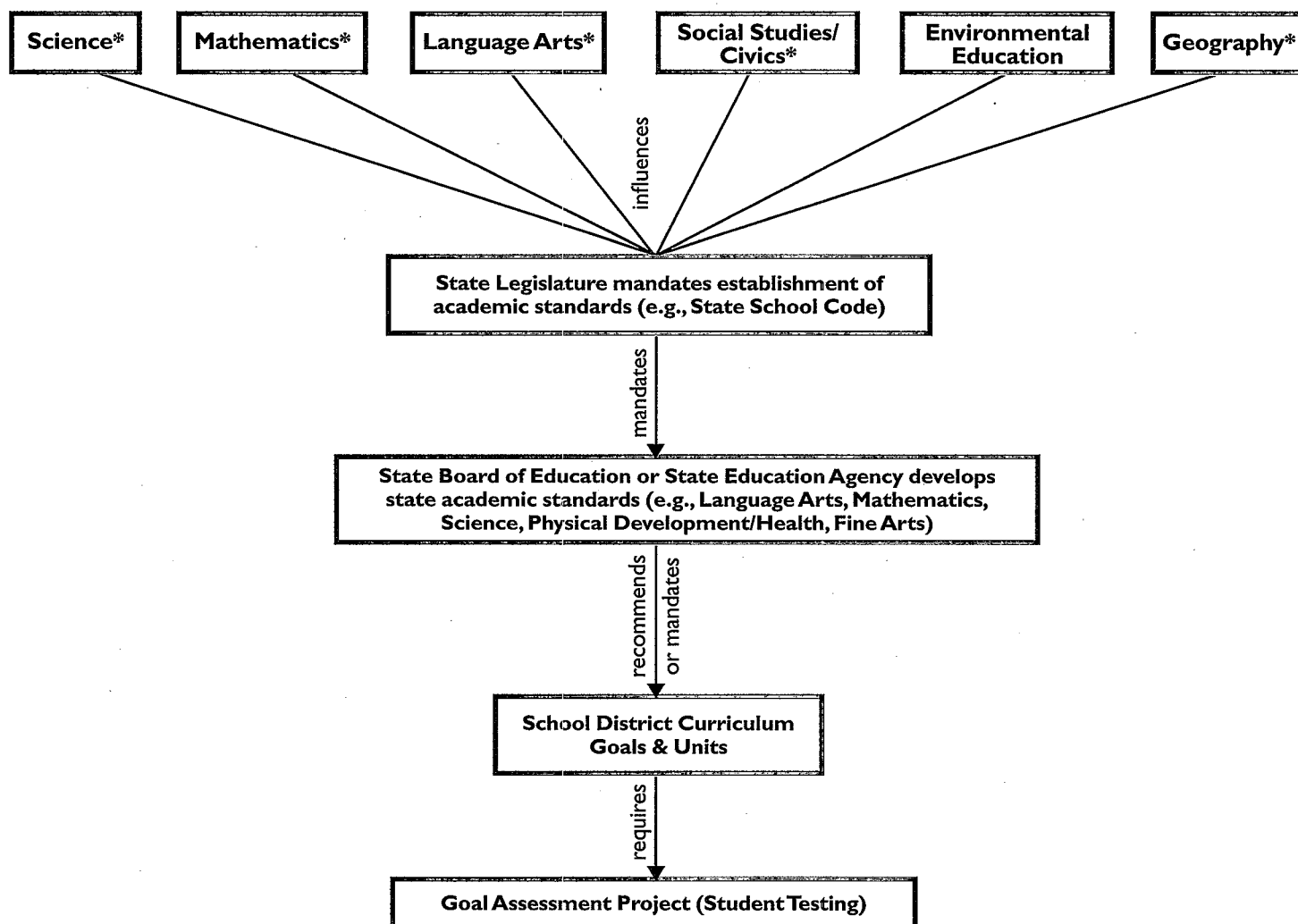
The national standards are voluntary; that is, they do not usurp state standards. Rather, states have the opportunity to use the national standards—representing the best thinking of leading educators in their respective fields—as guidelines for developing and revising their own curriculum standards. The chart on page 49 illustrates a generalized model of how national standards currently influence the curriculum in classrooms across the country.

Achieving Standards through Environmental Education

Teachers in many districts are under tremendous pressure to "teach to the standards" to improve academic performance. Often, this improved performance is defined by student scores on standardized statewide tests, many of which have been rewritten to reflect newly adopted, and sometimes challenging, standards for performance.

Standards have been written for disciplines such as math,

A Generalized Model Showing How Standards Are Used in Current Education Reform Efforts.

| Science* | Mathematics* | Language Arts* | Social Studies/ Civics* | Environmental Education | Geography* |

influences

State Legislature mandates establishment of academic standards (e.g., State School Code)

mandates

State Board of Education or State Education Agency develops state academic standards (e.g., Language Arts, Mathematics, Science, Physical Development/Health, Fine Arts)

recommends or mandates

School District Curriculum Goals & Units

requires

Goal Assessment Project (Student Testing)

* Environmental education strategies and content may be infused within these subject areas.

science, English and language arts, civics, social science, history, and physical education. Until recently, however, there were no standards written specifically for environmental education. According to Dr. Bora Simmons, a professor at Northern Illinois University, "Environmental education is by its very nature interdisciplinary, so it can help students meet the high standards set by the traditional school disciplines. But states often do not feel they have the time nor the resources to do the research needed to develop environmental education standards from scratch." While some of the discipline-based standards do reflect strategies and content that pertain to environmental education, none are comprehensive, nor do they provide a unified voice for the field.

In response, the North American Association for Environmental Education (NAAEE) undertook the National Project for Excellence in Environmental Education. Spearheaded by Simmons, the multi-year program is designed to identify and provide examples of high quality environmen-

tal education practice. The Project is focusing on four interrelated efforts:

- Publishing *Environmental Education Materials: Guidelines for Excellence*;

- Creating a series of educators' guides to quality environmental education resources (*The Environmental Education Collection: A Review of Resources, Volumes 1–3* and *The Biodiversity Collection: A Review of Resources*);

- Developing environmental education learner guidelines (*Excellence in Environmental Education: Guidelines for Learning (K–12)*; and

- Developing a set of recommendations for the preparation and continuing education of teachers and other environmental educators.

The Project is funded by the U.S. Environmental Protection Agency through the Environmental Education and Training Partnership (see page 62).

With *Excellence in Environmental Education: Guidelines for Learning (K–12)*, which was completed in February 1999, teachers can "develop a coherent, comprehensive environmental education program—and use the environment to create integrated learnings while also meeting the standards set by the traditional disciplines," says Simmons. The *Guidelines* identify what learners should know and be able to do in grades K–4, 5–8, and 9–12 in order to graduate as environmentally literate citizens. Specific references to ten discipline-based national standards are included. Research conducted by the State Education and Environment Roundtable (see page 59) demonstrates that such integrated approaches do indeed result in improved performance on standardized tests.

Which States Require Environmental Education?

According to a 1995 survey by the National Environmental Education Advancement Project (NEEAP), twelve states have a requirement or by-law for K–12 environmental education instruction. As defined by NEEAP, this requirement or by-law obligates schools and K–12 teachers to incorporate environmental education into their existing curriculum as a result of a legislative or administrative ordinance.

How this is accomplished varies from state to state. In Louisiana, for example, environmental education is included in the state Science Framework. In "Strand 4:

Environmental Education Instruction in States

According to a 1995 survey conducted by NEEAP, these states have a by-law or requirement for K–12 environmental eduation instruction. An updated survey will be published in 1999. More information is available at this web site: http://neeap.uwsp.edu/statusofEE/status.htm

Arkansas	*Maryland*
California	*Nevada*
Georgia	*Ohio*
Illinois	*Pennsylvania*
Iowa	*Washington*
Louisiana	*Wisconsin*

Science and the Environment," the framework begins with a focus statement about environmental education and clearly articulates the standard: "In learning environmental science, students will develop an appreciation of the natural environment, learn the importance of environmental quality, and acquire a sense of stewardship. As consumers and citizens, they will be able to recognize how our personal, professional, and political actions affect the natural world."

Unlike Louisiana, Pennsylvania makes little reference to environmental education in any subject area, even though it is mandated by law. The same holds true for Nevada. Wisconsin's comprehensive environmental education program is described on page 46.

While many states do not mandate environmental education, related content and skills are often taught in a number of subject areas.

The Role of Nonformal Institutions

Because of increasing emphasis placed on achieving state standards, many nonformal education institutions are linking their activities to standards in their respective states. This is especially true when it comes to the significant influence many school administrators have placed on standards. For example, in a recent study of a number of public school principals in central Texas, principals were found to be more concerned than teachers with how outdoor field trips connect to the standards and, more specifically, to the curriculum. These data indicate that it is important for nonformal education organizations to be able to show principals how their programs meet the state or district standards.

In Florida the situation is different. There, the state science standards link specific nonformal education sites to Florida education reform efforts. The standards are arranged in strands that include references to such nonformal science institutions as the Miami Museum of Science, the Odyssey Science Center in Tallahassee, and the Museum of Science and Industry in Tampa.

Selecting Supplemental Curriculum that Helps Achieve Standards

Many educators turn to supplemental activity guides for ideas and assistance in designing their environmental education programs; but it is sometimes difficult to know how well these supplemental guides advance the goals set by *Guidelines for Learning (K–12)* or by a state's disciplinary standards. Because there are so many materials from which to choose, selecting a program that is effective in any particular set of circumstances can be difficult.

Environmental Education Materials: Guidelines for Excellence, another of NAAEE's National Project for Excellence in Environmental Education publications, makes the process for selecting and developing environmental education materials easier. The *Guidelines* help developers of

activity guides, lesson plans, and other instructional materials produce high quality products and provide educators with a tool to evaluate the wide array of available materials. Six key characteristics—fairness and accuracy, depth, skills building, action orientation, instructional soundness, and usability—are described.

Four other publications, *The Environmental Education Collection: A Review of Resources for Educators, Volumes 1–3* and *The Biodiversity Collection: A Review of Biodiversity Resources for Educators*, were produced to help educators find curricula, multimedia resources, and other educational materials that can enhance teaching in a variety of settings (see box). Based on the materials guidelines, these "reviews" analyze more than 150 different curricular materials. Each review indicates the strengths of the materials and other considerations when compared to the six key characteristics in the *Guidelines*. Also included are a short description of the material, core curriculum areas reflected, length, date published, cost, and contact information.

With tools such as these, educators can select excellent supplemental environmental education curricula to use with their students. In doing so, they will be helping their students achieve high academic success.

Mike Kaspar, Ph.D., is the Environmental Education and Training Partnership (EETAP) Training Coordinator for the North American Association for Environmental Education in Washington, D.C. He is an adjunct faculty member at the Anne Arundel Community College in Arnold, Maryland, and in 1996 served on the Science Task Force of the Austin, Texas, Independent School District.

For more on Standards...

WEB SITES

American Association for the Advancement of Science: Project 2061
http://project2061.aaas.org

EdGateway Environmental Education Community
www.edgateway.net

EnviroLink: The Online Environmental Community
http://envirolink.org/

Environmental Education and Training Partnership (EETAP)
www.eetap.org

Environmental Education Link on the Internet
http://eelink.net

Global SchoolNet Foundation: Hotlist of K–12 Internet School Sites
www.gsn.org/hotlist/index.html

Mid-Continent Regional Educational Laboratory: Standards at McREL
www.mcrel.org/standards

North American Association for Environmental Education (NAAEE)
www.naaee.org

Third International Mathematics and Science Study
http://nces.ed.gov/timss

U.S. Department of Education
www.ed.gov

U.S. Department of Education: Sites Offering Academic and Skill Standards
www.ed.gov/G2K/standard.html

U.S. Environmental Protection Agency, Office of Environmental Education
www.epa.gov/enviroed

PUBLICATIONS

Excellence in Environmental Education: Guidelines for Learning (K–12)

Environmental Education Materials: Guidelines for Excellence

The Environmental Education Collection: A Review of Resources for Educators, Volumes 1, 2, and 3

All published by the North American Association for Environmental Education between 1997 and 1999.

NAAEE Publications Office
410 Tarvin Road
Rock Spring, GA 30739
(706) 764-2926
www.naaee.org

The Biodiversity Collection: A Review of Resources for Educators

Published by NAAEE and World Wildlife Fund, 1998.

WWF Publications Dept. CA5
PO Box 4866
Hampden Post Office
Baltimore, MD 21211
(410) 516-6951
www.worldwildlife.org

Knowing What Works: Trends in Educational Assessment

by
Joe E.
Heimlich

esting has long been the dominant means of assessing students. This approach basically works when much of what happens in traditional, discipline-based classrooms is the transfer of facts, figures, and cognitive tidbits from teacher and text to student. If teachers are to use environmental education to help achieve the goals of education reform, there must also be changes in how learning, and learners, are assessed. Assessment tools have to reflect the thinking process, and acknowledge that the educated student is one who can take complex sets of data and ideas, formulate opinions, make decisions, and take action.

Assessment can—and should—help students learn better and teachers teach better. A body of evidence demonstrates that what is evaluated or tested drives what students perceive as important, and therefore what they concentrate on learning.[1,2] The form of assessment directly affects student motivation; it can help to change the focus of learning from recalling facts to using facts to express ideas, and other higher-order thinking.

Also valuable tools for teachers, nontraditional assessments provide ongoing feedback that allows teachers to adjust instruction to better assist student learning. Cyndy Curran, a teacher at Iditarod Elementary School in the Matanuska-Susitna Borough Schools in Alaska, says:

> "Using alternative assessments has allowed me to get a better sense of what *all* of my students know and can do. This is especially true of English-as-Second-Language (ESL) students who, when faced with paper and pencil tests, are at a distinct disadvantage. However, when they're given the opportu-

nity to demonstrate their knowledge in a different format, everything they really know and are able to do comes shining through and they have a real sense of accomplishment."

All assessments are designed to measure outcomes against claims. This is relatively easy when the objective of learning is for the student to recall facts or ideas. It's much harder to measure creativity, problem solving, critical thinking, decision-making, or conceptual understanding—all essential components of both environmental education and education reform—in a manner consistently applied to all students.

The key to any assessment tool is that it be valid. A valid instrument measures *what* it is supposed to measure, *all* that it is to measure, and *only* what it is to measure. With education reform, assessment is tied to measuring significant content in instruction, including higher level thinking skills, decisions for action, and process skills. These skills and processes are difficult to measure using traditional fact-based testing strategies.

New ways of defining and measuring student achievement go hand in hand with education reform. It is vital in the education reform movement to let students know at the *beginning* of a lesson the expected gains in skills, understandings, *and* content. Students also need to know in advance how these gains will be measured. Using examples from several Ohio schools, the following sections explore some of the themes and terms used in education reform and assessment: performance-based assessment, portfolios, rubrics, assessing cooperative learning, competency-based

assessment, and nonformal environmental education and nontraditional assessment.

Performance-Based Assessment

In performance-based assessments, learning or solving complex tasks is measured using a similar complex task. To an outside observer, performance assessments are often indistinguishable from learning activities; the major difference is that the learners are aware the activity is being used for assessment and know the criteria that will be used for scoring or grading their performance.

Performance-based assessments are often synthesizing activities incorporating writing, reflection, graphic representations, presentations, or other efforts that reveal the process as well as the outcome of the students' work. At Bexley High School in Columbus, Ohio, teacher Richard Smith used performance-based assessment to measure the progress of his students' understanding of a complex environmental issue. Smith had each student identify personal daily actions that required electrical energy. During the course of the unit on electricity, students were to assess their energy use, document changes they made (or did not make) in their lives, and support their behaviors with scientific information. The assessment was made based on the ability of the students to explain the influence of competing environmental impacts and other issues on their decisions about electricity use.

Portfolio

A portfolio is a purposeful collection of student work to exhibit the student's effort, progress, and achievements. Some have called portfolio assessment the process of "collection, selection, and reflection." Portfolios are usually developed by having students save all tangible evidence of work, including art projects, writing efforts, quizzes, tests, and notes. Each student, with the teacher, sets the criteria for se-

lecting and judging the work. Then students select examples of their work to be included in their portfolio for grading. Grading is usually done in a meeting between teacher and student, and sometimes with a panel of teachers, administrators, community members, and parents.

The portfolio process has been demonstrated at Coalton Elementary School in rural Waverly, Ohio. At the beginning of the unit, the teacher and the class discussed what "should be learned" by the end of the unit. Homework, in-class activities, reflective writing efforts, and projects were assigned as portfolio pieces. At the end of the unit, each student chose three samples of work from the beginning of the unit and three from the end. The teacher met with the students in small groups. In these groups, students compared their work against the criteria the class established, and explained differences in understandings between their earlier and later work. Students then wrote individual reports on what they experienced, learned, and gained through the unit and the assessment process. These reports incorporated comments from their group, their teacher, and their perceptions of their own progress.

Rubrics

A rubric is a matrix defining expectations and indicators of quality for a task or concept. Rubrics clearly identify for students what is to be gained from a particular lesson, and how that gain will be evaluated. The rubric itself is not an assessment; rather, it is a structure for establishing performance levels and quality to guide learners to meet desired outcomes.

Rubrics set the standards for measuring the quality of a student's work and are designed for use with performance assessments, portfolios, and other forms of assessment. Knowledge, behaviors, competencies, and products are identified and defined in the matrix. Concrete expectations that identify fulfillment of criteria are listed for satisfactory

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Portfolio Sample

During a unit introducing the hydrologic cycle and exploring human interaction with the water cycle, students at Coalton Elementary School created portfolios of their work. They selected such elements as:

- a home water use inventory with follow-up action ideas
- drawings of the hydrologic cycle, one drawn at the beginning of the unit and one at the end
- math worksheets calculating water use
- poems about rain
- worksheets based on a video watched and discussed in class
- writing assignments summarizing what they learned from different activities
- a mini lab book documenting experiments and demonstrations about water

or unsatisfactory performance, a letter grade, or a performance score. The rubric is developed by the teacher, often with input from the students. Rubrics have gained in popularity, as traditional assessments do not reveal complex thought, creativity, and other elements of holistic learning.

In Upper Arlington High School in suburban Ohio, physics teacher Phil Lampe developed a rubric to assess student progress during a unit in which students simulated the decision-making of a community attempting to build a nuclear power plant. The rubric measured three primary constructs: factuality, creativity, and participation. Specific, observable outcomes were identified for each letter grade (see box on page 55):

Assessing Cooperative Learning

Emphasis on authentic (real-world) decision-making and teamwork have led to increased use and assessment of cooperative learning. In cooperative learning settings, there are two processes that are assessed: the product and the teamwork. The product, or outcome, can be assessed in the manner most congruent with the teacher, the content, the class, and the learners. The cooperative element is usually assessed using self, peer, and teacher observations, checklists, or scoring sheets. The criteria used in the evaluation are set either in the cooperative teams with the teacher or as a full class. Grading often uses a rubric and the teacher meets with each team before assigning the grade. Many teachers find that cooperative grading works for authentic assessment for several reasons: although time consuming, the assessment process becomes part of the learning; by using cooperative teams, the individual receives feedback and grades from multiple sources; and the consistency of grades is improved by the use of peers.

Competency-Based Assessment

Industry has used competency-based assessment for years. In schooling, vocational programs have also used competency measures for centuries in apprenticeship programs. A competency-based assessment divides learning into necessarily cumulative steps, then requires the learner to demonstrate competency (the ability to perform at a specified level) before progressing to the next task. Competency-based assessments are often used for skill-driven curricula. The most common example of competency-based assessment is in industrial training where individuals must complete various tasks to a satisfactory level before they move up to the next level of responsibility.

Competency-based assessments in the classroom often look like individualized work plans. In one example, the teacher gave the students a series of tasks involving investigating a local environmental problem. The tasks were cumulative in nature: identify a problem in the local environment, find resources on the general problem, find resources

on the local situation, compile the information, construct questions, develop a research project to answer questions, conduct a study, present findings, and participate in local action. Students met with the teacher to review their progress on each task and make sure it was successfully completed before they moved on to the next one.

Nonformal Environmental Education and Nontraditional Assessment

Many teachers take advantage of environmentally-oriented programs offered by the nonformal education sector, such as field trips to outdoor areas and tours of museums and nature centers. These experiences are most effective when integrated with course content, and can be ideal for applying many forms of nontraditional assessment. Working with teachers to incorporate the learning from the nonformal setting into portfolios, rubrics, or performance-based assessments enhances and validates the nonformal program. This creates a framework for students to realize the value of the learning from these programs.

For example, one Ohio nature center uses performance-based assessments to see if hikes are teaching the skills desired: toward the end of the hike, the naturalist has the youth participate in a hunt in which each of the youth must find and identify three to five of the species focused on during the hike and explain how they "knew" what they found. One zoo works with a local school district to ensure that the programs offered by the zoo fit within the school's course of study and the activities the students are engaged in at the zoo become part of the students' portfolios. Many science museums work with formal education institutions to provide skill training that is part of the scoring guide for science classes.

Environmental Education as a Catalyst for Nontraditional Assessment

If assessments are to be used to truly enhance learning, they must not only look different, but must accurately measure the very traits, skills, and cognitive processes we want them to measure. Environmental education, at its core, has several of the characteristics needed for successful application not only in education reform, but in assessment within the reform movement. By its very nature, environmental education simultaneously draws on many disciplines. It requires learners to use higher level thinking skills, such as decision-making about complex situations or integrative problem-solving. Environmental education can place the learners' actions within the context of the real world. It is a natural catalyst for using nontraditional forms of assessment to further the goals of education reform.

SAMPLE RUBRIC: Evaluating the Simulation of Community Decision-Making Regarding a Nuclear Power Plant				
	To earn an A*	**To earn a B***	**To earn a C***	**To earn a D***
Factual Information	Using at least eight varied sources to present science-based and social science information that supports your position and anticipates the arguments of other groups	Using five or more sources to present science-based and social science information that supports your position	Using more than three sources to present science-based and social science information that supports your position	Presenting factual information with minimal citation
Creativity	All to earn grades B-D, plus incorporate dress, behavior of the role in the simulation, including a unique perspective that goes beyond the role card	Assume the role assigned, interview people in the community, fully play out the role in the simulation	Assume the role assigned and do basic research on the position for that role	Participate in the simulation activity
Participation	Presenting your information in an appropriate manner and fully exploring your assigned role	Doing more than the required research, participating in the simulation in the role assigned	Doing required research on the topic and the community and participating in the simulation	Being present

*Many people prefer to correlate rubrics with general standards (basic, proficient, advanced) rather than letter grades.

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2 Herman, J. L. "What Research Tells Us about Good Assessment." *Educational Leadership* 49 (May 1992): 74–78.

RECOMMENDED READING

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Slavin, E. R. *Student Team Learning: A Practical Guide to Cooperative Learning.* 3rd ed. Washington, D. C.: National Education Association, 1991.

Joe E. Heimlich, Ph.D., is Leader, Environmental Science for Ohio State University Extension and an Associate Professor of Environmental Education in the OSU School of Natural Resources, which is a partner in the Environmental Education and Training Partnership. Heimlich also works with the EETAP Resource Library.

Transforming Study Hall into an Integrated Curriculum

PROGRAM PROFILE

BY FREDERIC R. WILSON

When community leaders in Huntingdon, Pennsylvania, face an environmental problem, they're likely to call on the sixth graders at Huntingdon Area Middle School to help. These students have earned their reputation as knowledgeable and capable community stewards. Over the last five years, for example, they:

- Launched a three-year campaign to correct a severe local pollution problem. Having discovered the problem while testing water quality on Muddy Run stream during their science class, students traced the pollution to storm water runoff infiltrating and overloading a sewer line. They wrote a proposal for—and received—a $250,000 state grant to replace three miles of broken sewage lines.

- Helped to design, pay for, construct, landscape, and build a wetland on school property to reduce problems associated with storm water runoff in their community.

- With community partners, constructed a swale along a flood-prone section of Muddy Run to prevent flooding and reduce erosion. In January 1999, the students received a $3,600 Watershed Restoration Assistance Grant from the Pennsylvania Department of Environmental Protection, which they will use to plant trees and understory scrub to stabilize the swale.

These sixth graders are taking part in a program called *Science Teams in Rural Environments for Aquatic Management* (STREAMS). Developed at Huntingdon, STREAMS is an integrated curriculum that incorporates environmental topics into hands-on learning activities in science, math, social studies, and language arts. A team of four teachers conducts the classes, including program co-founders Frederic Wilson and Timothy Julian (see box). A large portion of the program is based on voluntary student participation.

Like most new programs, STREAMS did encounter initial obstacles. Scheduling, funding, and convincing community leaders to involve students in local problems all required creative approaches. The school made time in the schedule for these extra learning opportunities by using former study hall periods and letting students continue their work in an after-school environmental club. Grants helped meet the funding challenge. Program participants earned the cooperation of community members and parent volunteers as students proved themselves capable of designing relevant projects and doing accurate field work.

Getting Started

Given an already full curriculum at Huntingdon, STREAMS started as a way to liven up study hall periods. Students were offered a choice of taking a study hall or getting involved in hands-on, environmentally-oriented academic study and outdoor learning. Many students enthusiastically volunteered for the rigorous program.

STREAMS was fortunate to have the support of principal Jill Adams from the start. Adams said, "Administering the STREAMS program is exciting because both students and teachers are engaged in the learning process, and it benefits both. It's this type of academic endeavor that will help schools meet national standards in math and science. All it takes is a change in teaching approach, collaboration, and a willingness to make it happen."

In fact, when administrators saw the outcomes of the voluntary program, they

Collaboration Among Staff is Key

When Huntingdon Area Middle School students head to the river to monitor the water quality, Rose Taylor, the language arts teacher, is there. She also prepares students for STREAMS activities by making sure they understand vocabulary words they will need, working with students on writing assignments, and grading other subject papers as if they were turned in to her in language arts.

Math instructor Mike Simpson teams with colleagues to teach students how to interpret statistics, construct charts and graphs, and use word processing and database skills to complete tasks. He uses data collected by students during field studies to engage them in problem-solving activities and to teach fractions, percentage, median, and mode.

Tim Julian, the science teacher, integrates the physical, chemical, and biological sciences to help students understand the properties of water and the physical features of a stream. Students investigate ways of treating drinking water and waste water; conduct limnology tests; examine plankton; compare fresh and salt water; and use computer programs to construct charts and graphs, and to analyze limnological data.

Fred Wilson, the social studies instructor and STREAMS program director, relates environmental topics to citizenship and stewardship as students evaluate the environmental impacts of land use. His students share their discoveries with appropriate authorities and encourage the potential solutions they have researched. As Environmental Club advisor, Wilson gives students opportunities to volunteer for community projects that improve their local environment.

knew they had a good thing going. They soon integrated the STREAMS program into the school's core science curriculum. Now, all sixth-grade students at HAMS participate in a 50-hour core program at the beginning of each school year. About 60 percent of the 6th grade curriculum is covered in team-taught, interdisciplinary classes, largely using hands-on activities and outdoor studies. This approach required changing the school schedule to allow longer time blocks, and cultivating a willingness in teachers to allow individual students to occasionally adjust their schedules.

A STREAMS curriculum document, specifically created to help teachers integrate environmental education into their school, is available at www.ems.psu.edu/HAMS/.

A Motivated Group

After they complete the core course, students can—and do—choose to take part in voluntary environmental activities to benefit their community. They carry out most of these activities through the after-school club, which averages 60 members each year. Students conduct original research, prepare and analyze surveys, monitor water quality, write grant proposals to fund student-driven projects, and make presentations at conferences or civic organizations. Students design and carry out these projects on their own, with assistance from teachers as needed. Their next task is to construct a large study garden to attract hummingbirds and butterflies and provide more opportunities for integrated, hands-on study on the school site.

The extra study and community projects are entirely voluntary and students involved earn no academic credit. So, why do students volunteer? According to Rachael, one of the original STREAMS program participants, "It made us feel like we were making a difference." Alison, another former participant who helped with developing surveys, public speaking, creating the wetlands, building the swale, planting trees, and monitoring stream water quality, said she "liked that adults listened to us and allowed us to help our town."

As a sixth grader, Heather spearheaded the start of an environmental newsletter, Reflecting on her experience two years later, she said, "I realize that when students have the courage to speak and act with knowledge, adults will listen. Not only adults have the power to change things. Students do, too."

Frederic R. Wilson is a team teacher of 25 years who has received outstanding educator and community service awards. He has made numerous local, state, and national presentations promoting the integration of environmental education into school curricula, has been a consultant to educational and environmental institutions, and has conducted student and teacher environmental workshops.

Peer Teaching: Two sixth grade students master a computer graphic program in order to help teach classmates how to plot water quality data from field studies of local streams.

Multi-Grade Activities (above): Two high school advanced biology students team with two sixth grade students to complete a nitrate and phosphate evaluation at the Huntingdon Area Middle School Wetland. Cross-grade, multidisciplinary projects are encouraged.

Audits: They're Not Just for Taxes Anymore!

BY LAUREN POLLOCK MCFALL

"It's so nice to do something worthwhile at our own school. We don't even have to get a bus!"

"This curriculum is one of the best I've seen. The best part is, it's locally based."

These are the responses E2: Environment & Education (E2) coordinators heard from Arizona teachers when they conducted a workshop on their *Environmental ACTION* curriculum, a science-based, interdisciplinary environmental audit curriculum for middle and secondary school students. The curriculum gives students and teachers a step-by-step process for learning about environmental issues and their impact on human health and environmental quality.

One of E2's main goals is to ease the introduction of the new curriculum into classrooms on a district-wide basis. In 1998, the U.S. Environmental Protection Agency awarded E2 a grant to train twenty Tucson area educators through a one-day workshop in fall 1998 and year-long follow-up support. The workshop provided teachers the opportunity to learn about environmental action projects and how they can enhance a classroom's current curriculum. After setting implementation goals for the year, the educators are working with E2 trainer M. Lynette Fleming, a Tucson resident, to explore the varied ways they can integrate *Environmental ACTION* into their current teaching. Through the grant, E2 is carrying out the same district-wide· approach with E2 trainer Emi Gittleman and the Ossining School District in New York.

Participants in both workshops stated that they were pleased to discover the accuracy, yet flexibility, of the materials. The teachers were glad they can use each module separately from the others, allowing them to choose the topic(s) most appropriate for their grade level. Fleming reports that many of the Arizona teachers have already worked up plans to use the materials to implement a campus audit during the current school year, which is a requirement of participating in E2's grant program. Added enticement comes from having other teachers in the district using the same program, and knowing there is coordinated support from E2 educators.

The *Environmental ACTION* program consists of six modules. The modules are part of a complete curriculum package. They can be used in companionship with one another, or they can stand alone. Each module includes a teacher resource guide and a student edition. Following is a brief description of the six modules:
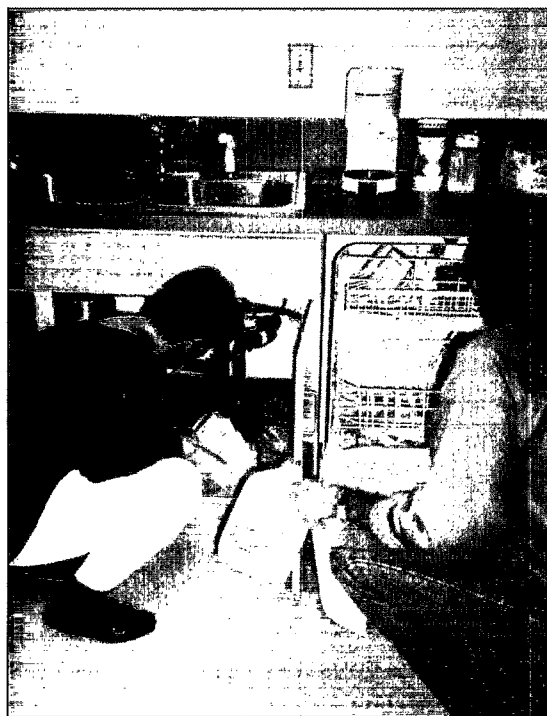
Teachers conduct a campus audit.

Energy Conservation
Students explore the sources, production, uses, and environmental effects of energy. They apply their learning by examining ways to improve the energy efficiency of their school and homes.

Food Choices
Students investigate the effects of food production, diet, and nutrition on human health and the environment. Students analyze their food choices and the school's food service program to identify healthy choices and practices.

Habitat and Biodiversity
Students study the importance of biological diversity, landscape management, xeriscaping, composting, and integrated pest management. Students assess the current landscaping, then evaluate its present health and environmental impact. This module also contains a step-by-step guide to creating an organic garden and seed bank.

Chemicals: Choosing Wisely
Students investigate the types of materials, chemical products, cleaning supplies, and pesticide practices used in their school, including how they are used, stored, and disposed of, and what their potential effects are on human health and the environment. Students then develop a plan for using Earth- and human-friendly alternatives to hazardous chemicals at school and at home.

Waste Reduction
Students sort and analyze school waste to identify recyclable and compostable materials. This helps them identify ways to reduce consumption and waste at school and at home. They then develop an improved waste management program.

Water Conservation
After an introduction to water consumption and quality issues, students will conduct an audit of water usage and efficiency on the school campus. They then develop strategies for implementing water conservation at school and at home.

For many activities, students work in small action groups. This allows for leadership opportunities, independent work, a practical way of assessing the school campus, and a comprehensive approach to the issue. Activities are cross-curricular with suggested extension paths by different subject areas; they also demonstrate the interconnections of various aspects of the issue.

Through the practice of taking action students begin to recognize their own

A Framework for Learning

Huntingdon Area Middle School (see page 56) is one of 40 schools included in a recent nationwide study on using the environment as an integrating context for learning, referred to as EIC. The State Education and Environment Roundtable prepared a report on the findings of the study, *Closing the Achievement Gap*, that indicates students learn more effectively within an environment-based context than within a traditional educational framework. This evidence comes from site visits, interviews, survey results, and gains on both standardized test scores and grade point averages.

The observed benefits of EIC-based programs are both broad-ranging and encouraging. They include:

- Better performance on standardized measures of academic achievement in reading, writing, math, science, and social studies;

- Reduced discipline and classroom management problems;

- Increased engagement and enthusiasm for learning; and,

- Greater student pride in and ownership of accomplishments.

The Roundtable's efforts to study and promote EIC stem from a 1994 study that revealed a broad-based need for better information about integrating environmental content, pedagogy, and principles into formal K–12 educational systems. As part of the study, representatives from nine state education agencies met and identified steps needed to build the knowledge base for EIC. Their recommendations included establishing a national body to help facilitate information-sharing among state agencies and identify successful implementation strategies that might be replicated.

In response, the Roundtable was created in 1995 with funding from The Pew Charitable Trusts. Its mission is to "aid state education agencies in their efforts to improve learning by using the environment as an integrating concept." The Roundtable concentrates on serving the needs of twelve member states with already-established foundations that could most benefit from concentrated support.

Through semi-annual meetings, the Roundtable seeks to assist the member states' program coordinators to refine their skills, share experiences, and identify beneficial resources. To build a knowledge base, the Roundtable researches case studies and collects information on existing EIC and environmental education programs. Research results are disseminated through the semi-annual meetings, as well as on the Internet and at state and national conferences. They are used to develop and disseminate recommended strategies for addressing essential components of effective state programs in environmental education. The Roundtable also offers seminars; a technical assistance register; and an Internet-based communication system that includes links to related sites, access to Roundtable publications, and an on-line EIC discussion group (via Ed-Gateway, see page 16).

Members of the Roundtable coined the term and define EIC as "education that employs natural and built environments as the context for learning and, within that framework:

- crosses traditional disciplinary boundaries;

- relies on team-teaching;

- provides hands-on learning experiences, often through project-based, problem-solving activities;

- offers cooperative learning opportunities; and

- adapts to the needs of individual students through learner-centered methods."

EIC is about using a school's surroundings and community as a framework within which students can construct their own learning, guided by teachers and administrators using proven educational practices. EIC-based programs typically employ the environment as a comprehensive focus and framework for learning in all areas: general and disciplinary knowledge; thinking and problem-solving skills; and cooperation, interpersonal communication, and other basic life skills.

By providing a comprehensive educational framework instead of traditional compartmentalized approaches, research results indicate that EIC significantly improves student performance throughout the curriculum and appears to enrich the overall school experience.

For more information on EIC, contact:
State Education and Environment Roundtable
16486 Bernardo Center Drive, Suite 328
San Diego, CA 92128
(619) 676-0272
(619) 676-1088 (fax)
Web site: www.seer.org

Audits, continued

actions as part of the "problem," and more importantly, part of the "solution." They also gain experience in real life issues, cost benefit analysis, and negotiating for change.

For more information about the Environmental ACTION program, district-wide implementation, and available outreach services, contact the E2 main office in Boulder, CO at (303) 442-3339. The modules are published and distributed by Cuisenaire/Dale Seymour Publications, (800) 872-1100.

Lauren Pollock McFall, Director of Outreach Services for E2, has worked with all age groups both in the classroom and the outdoors. She has a B.A. in education, teaching certificates in California and Arizona, and a master's degree in curriculum development and leadership.

As part of Project del Rio, a Gadsden High School student demonstrates different reasons for groundwater contamination to New Mexico grocery shoppers.

The Ties That Bind: Developing School-Community Partnerships

by Caroline Taylor

Modern technological advances such as air travel, television, and the Internet have in many ways liberated people from the established hierarchies and prescribed social roles of traditional communities. But while technology expands our horizons, it also strains the personal connections that are born of shared history, shared interests, and shared responsibility. And as our lives become more compartmentalized, social interactions within communities are increasingly divided along the lines of family, work, school, and worship.

These circumstances are perhaps most evident in urban areas, where the natural environment—once a clear focus of shared responsibility—seems removed from the substance of daily life. How can students be expected to embrace the natural world when they are isolated from that world during school hours? How can a community encourage young people to participate in environmental stewardship? How can measures to protect the environment expand beyond the dedication of a concerned few?

One answer is school-community partnerships. Under the umbrella of environmental education, schools and communities can find ways to combine their agendas in projects that simultaneously conserve precious natural resources, strengthen personal connections, and engage students in a learning process that is active, meaningful, and fruitful.

A Different Kind of Classroom

Students at South Colby Elementary in Port Orchard, Washington, get their feet wet and their hands muddy not at recess, but while they're in class. In fact, the students themselves created this on-site interpretive nature trail and wetland "classroom" where they can observe mallard ducks and other indigenous species as they learn firsthand about the wetlands' role in controlling flooding and eliminating toxins from the water. In this classroom, real-life issues become the context for assignments that can challenge and improve students' basic reading, writing, and math skills.

The South Colby program has not only redefined the

classroom, it has provided a way for parents and other members of the community to get involved. Senior citizens and experienced landscapers recently joined the school in planting gardens and rescuing indigenous plants from the surrounding area. "This has allowed us to embrace a new set of volunteers, often people who were never sure how they could fit into the volunteer puzzle at South Colby," says fourth grade teacher Steve Maddox. "We've had many master gardeners come out and help."

Nurturing Stewardship

In an urban setting, connecting with nature is not as daunting a challenge as it may seem. At the Robert Nathaniel Dett Elementary School in one of Chicago's most impoverished neighborhoods, a butterfly garden is helping students learn about the environment while enhancing the city's local biodiversity. The garden grew out of a 1996 workshop to provide Chicago educators with biodiversity education training. The workshop was created in partnership with the World Wildlife Fund and the Chicago Wilderness Project, a collaboration of 54 public and private organizations whose mission is to protect, restore, and manage Chicago's natural areas.

"There was a fenced-off empty lot near the school," says Dett science teacher John Roper, "and we'd clean it up every year on Earth Day. But we knew we could do more than just give kids a cement playground." The school appealed to the city of Chicago to become one of the first schools to have its own park. Then, under the "Adopt-a-School" program, it joined forces with the Blue Cross-Blue Shield organization who provided the services of a horticulturist. The horticulturist worked with students, teachers, and parents to select native plants that would attract butterflies. "The students studied the history of these plants and tried to predict which butterfly species would be attracted to them," says Roper. For their next project, Roper and his students plan to build bird houses and are already trying to predict what kinds of birds will use them.

Galvanizing the Community

Young people who get involved in their community become empowered young people. They learn that they can make a difference. In Vilas, South Dakota (pop. 2,800), students at Howard High School are getting involved in a town-wide

A student looks at organisms collected with a seine net from a lagoon at Chicago's Washington Park.

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Keys to Successful Partnerships

To forge partnerships that last and are meaningful to all involved, consider these fundamentals:

- Design programs that are mutually beneficial and advance the goals of all partners.

- Involve all parties from the start. Don't create the program *for* them, create it *with* them.

- Set realistic goals and make sure you have the human resources to achieve them.

- Outline key responsibilities and expectations clearly, and preferably in writing.

- Communicate regularly and openly. Listen and respond to all ideas.

- Be ready for the unexpected. Be flexible. Try new approaches.

- Seek involvement from the educational community: How can parents help? How about school administrators? Staff from the local museum? Local experts from universities?

- Expand your possibilities— draw on the entire community: Is there a restaurant or grocery store that can provide refreshments on the day you're planting a garden? Are the employees from a local business looking for volunteer opportunities? Would the local Kiwanis, Rotary, or Garden Club provide funding or volunteers? Can the communications department of a local corporate office lend the services of a designer for your brochure?

- Reward community participation. Send thank you letters, invitations to events, and copies of student work to demonstrate your appreciation.

effort to revitalize the local economy. Vilas is participating in the Annenberg Rural Challenge, a national program aimed at strengthening rural communities by supporting education that encourages students to become informed, active citizens. As Howard High School teacher Raymond Parry suggests, "There's more to education than what's in the textbook on page 28." Students at Howard have planted a two-acre apple orchard behind the school as well as a

strawberry field whose bounty they will market in the summer. Local gardeners are also helping the students develop a wholesale nursery and flower business.

In another example of informed community action, students at North Farmington High School near Detroit worked on a project to monitor the local water quality. Downstream from a city sewage pumping station, the students found elevated levels of bacterial contamination and traced it to the outflow of one of the pumping station's pipes. They shared these findings with the city engineer, who quickly mobilized a team to repair the malfunctioning pump.

The key to this bilateral approach to environmental education is relevance. Classroom activities help students recognize the connection between school ecology studies and shared community concerns such as water quality. When they can see the positive impact of their efforts, students are more motivated to identify and help solve local environmental problems.

Bridging the Cultural Divide

The potential benefits of school-community partnerships may be extended to virtually every area of study and every facet of life. In the case of Project del Rio (Proyecto del Rio), a water quality monitoring program along the Rio Grande, cultural awareness, geography, and language studies have been incorporated into the environmental education cur-

riculum. One of ten partners in the Environmental Education and Training Partnership (see box), Project del Rio was created in partnership with the nonprofit Tides Foundation and the Global Rivers Environmental Education Network (GREEN), an international organization dedicated to improving education by promoting watershed sustainability.

Using maps and other resources provided by the Project, students from various schools along the river from Taos, New Mexico to Brownsville, Texas and Matamoros, Mexico spend several days becoming familiar with the watershed. They examine regional land uses that might affect water quality as well as learn about local communities' water and sewage systems. Students from each participating school then travel to various locations along the river and sample the water quality. Through a bilingual computer network, the students share their findings with other schools. The result is a water quality profile of the Rio Grande along its entire length.

Dreaming Big

As the previous examples illustrate, opportunities for both formal and nonformal education abound in school-community partnerships. The more clearly this is demonstrated, the greater the chances are to rally support for innovative environmental education curricula. Long Middle School in Booneville, Mississippi is building a Center for Earth Science Studies with $6 million from the Southeast-

EETAP

The Environmental Education and Training Partnership (EETAP) was established to increase the capacity of education professionals to deliver quality environmental education. The multi-year, national project is managed by the North American Association for Environmental Education and funded by the U.S. Environmental Protection Agency, Office of Environmental Education.

EETAP works in three program areas:

- Deliver environmental education training for education professionals;
- Increase access to quality environmental education resources and information; and
- Develop the infrastructure to support quality environmental education and training.

EETAP Partners work with schools and organizations to achieve state and local education reform goals through environmental education. Examples include:

- Four Project Learning Tree (PLT) states have developed correlations of PLT curriculum to state standards. The work shows how PLT materials can help educators successfully meet education reform goals. The work also demonstrates to school administrators how environmental education advances quality education in their schools. National correlations have also been developed to promote PLT as a useful tool for meeting national science and social studies standards.

- Project WILD State Coordinators in three states are assisting teachers by providing correlation and assessment rubrics that help them meet state standards.

- WestEd, in collaboration with the California Schools Implementation Network, is working with 35 schools to promote environmental science through environmental education. Participating schools report 15 to 80 or more days of integrated environmental lessons in kindergarten through sixth grades.

For more information about EETAP, visit its web site at www.eetap.org or contact the staff by e-mail at questions@eetap.org or by phone at (202) 884-8788.

ern Regional Vision for Education (SERVE), one of ten Regional Educational Laboratories funded by the U.S. Department of Education (see page 47). "We are a small rural community," says Long Middle School Principal Linda Clifton. "We never thought this was possible, but SERVE encouraged us to expand our dreams and provided technical assistance along with encouragement." With contributions from the Smithsonian Institution, the National Aeronautics and Space Administration, and the Mississippi Department of Economic Development, the Center, a student-oriented learning environment as well as a training center for teachers in educational technology and environmental studies, is on its way to becoming a reality.

How to Get Started

If you are interested in forming school-community partnerships within your own community, how should you begin? A valuable resource is the Internet, one of the technological advances mentioned at the beginning of this article. While the Internet may encourage individuals to think beyond the confines of their community, it also allows real-time interaction among like-minded people from around the world. Talking about shared concerns can go a long way to refocus people's efforts in their own backyards. (See "Web Sites Worth Checking Out" on page 64 for a number of ideas.)

Needless to say, you can't stop in the virtual world; a main point of developing partnerships is providing real-world connections. The best resource, of course, is your own creativity. If you identify a local opportunity for a school-community partnership, go ahead and make a proposal to community leaders who can lend their support. And don't overlook potential contributions of volunteer time, meeting space, publicity, and expertise from businesses and organizations from whom you would typically solicit project funds. Many of the projects listed in "Partnerships with Nonformal Institutions" (see box) were developed outside the auspices of established programs.

Caroline Taylor is director of publications for World Wildlife Fund and a former director of editorial policy for the U.S. Department of Education.

Partnerships with Nonformal Institutions

- Since 1981, the Missouri Botanical Garden has operated ECO-ACT (ECO for ecology and ACT for acting, creating, and teaching), which teaches environmental issues and leadership skills to about 60 St. Louis junior and senior high school students of diverse backgrounds. The students receive class credit for teaching environmental concepts to elementary school students one hour per week.

- Fourth-graders in Tulsa, Oklahoma, participate in the "Secrets of Survival" environmental workshop at the city's zoo. The students are challenged to gain hands-on experience and use their critical thinking skills to discover adaptations that help organisms survive and reproduce. The fourth-graders leave with a greater understanding of the impact people have on the environment and how to care for, connect to, and conserve the natural world.

- In Providence, Rhode Island, third- and fourth-graders learn about trees by visiting places like the Rhode Island School of Design (RISD). At the RISD Museum of Art, they see how trees are depicted in art; at the local zoo, they see how animals use trees; at a local land

trust, they learn how trees grow and how wood products are used. The year-long program also includes teacher orientation, classroom materials, and exhibits of the students' artwork.

- Through a grant from the Howard Hughes Medical Institute Precollege Science Education Initiative, educators at Baltimore's National Aquarium provide workshops designed to complement Baltimore's new elementary school science curriculum for second- and fifth-grade students. Each summer 48 teachers from 24 schools participate in inservice workshops. They receive valuable training in marine science and receive a kit of materials designed to enhance students' hands-on learning.

- The Children's Discovery Museum in San Jose, California, has created a comprehensive environmental research program called "BioSITE," which serves 1,400 low-income children, families, and teachers in downtown San Jose. Participants use the museum's eleven-acre site along the banks of the Guadalupe River to conduct field studies on the effects of people and nature on the river and its inhabitants.

Web Sites Worth Checking Out

The following list is a sampling of Web sites that contain information on environmental education partnerships between schools and communities.

Computer Curriculum Corporation (www.cccnet.com/). Interactive Internet projects, including a virtual field trip to China, and travel through time.

The Department of Energy's Science Education Arcade (www.doe.gov). Information about the National Science Bowl, U.S. science centers and museums, and science for kids.

Education Week In Context (www.edweek.org/context). Community partnerships, school-based management, etc., with selected links to education sites on the Web.

The Environmental Protection Agency's Students and Teachers page (www.epa.gov/students/). Resources for teachers and a student center with information about environmental issues, clubs, and activities.

Give Water a Hand (www.uwex.edu/erc/). Lists national partners and how students can take action to improve local water quality.

GLOBE (Global Learning and Observations to Benefit the Environment) (www.globe.fsl.noaa.gov/). A worldwide network of students, teachers, and scientists studying the global environment.

GREEN Watershed Education Model (www.igc.apc.org/green/). A resource for schools and communities engaged in studying and protecting watersheds.

Indianapolis Zoo (www.indyzoo.com). Kiburi's Corner with quizzes, animal facts, and homework helpers for kids; and the zoo's Education Workshops page for classroom teachers.

Kids F.A.C.E. (Kids for a Clean Environment) (www.kidsface.org). An international children's environmental organization, established by a nine-year-old to help children get involved in protecting nature.

National Envirothon (www.environthon.org/). An annual competition for teams of high school students from 45 states and Canadian provinces, who compete for college scholarships on their knowledge of various environmental topics.

The National Wildlife Federation's Kids page (www.nwf.org/kids/). Information and project ideas for children and educators.

The National Zoo's Elephant House Video Conference (www.si.edu/organiza/museums/zoo/zooview/exhibits/elehouse/vidconf.htm). Live video conference every Thursday afternoon for anyone who logs onto the Web from an education institution anywhere in the world.

The Natural Resources Defense Council (www.nrdc.org/worldview/fwguid.html). Guides to clear skies and blue water as well as information about buying organic food, curbing global warming, and protecting children's health.

Service Learning (http://home.ican.net/~jrkalino/index.html). Resources and services for high schools that want to implement a service learning course for elementary or high school students whereby students serve and explore their communities from the classroom.

Sierra Club Environmental Education page (www.sierra-club.org/education/). Resources for teachers K–12.

UCLA Ocean Discovery Center (www.lifesci.ucla.edu/odc). A marine science learning center and interactive aquarium at the Santa Monica Pier.

Wildlife Discovery Program at the Houston Zoo (www.rice.edu/armadillo/Schools/Hisdzoo/index.html). Activities and programs for students and teachers. A third grade magnet school cluster center operated in partnership between the Houston Independent School District and the Houston Zoo.

Windows on the Wild (www.worldwildlife.org/windows/). Materials for educators and students that have been developed by World Wildlife Fund's WOW environmental education program.
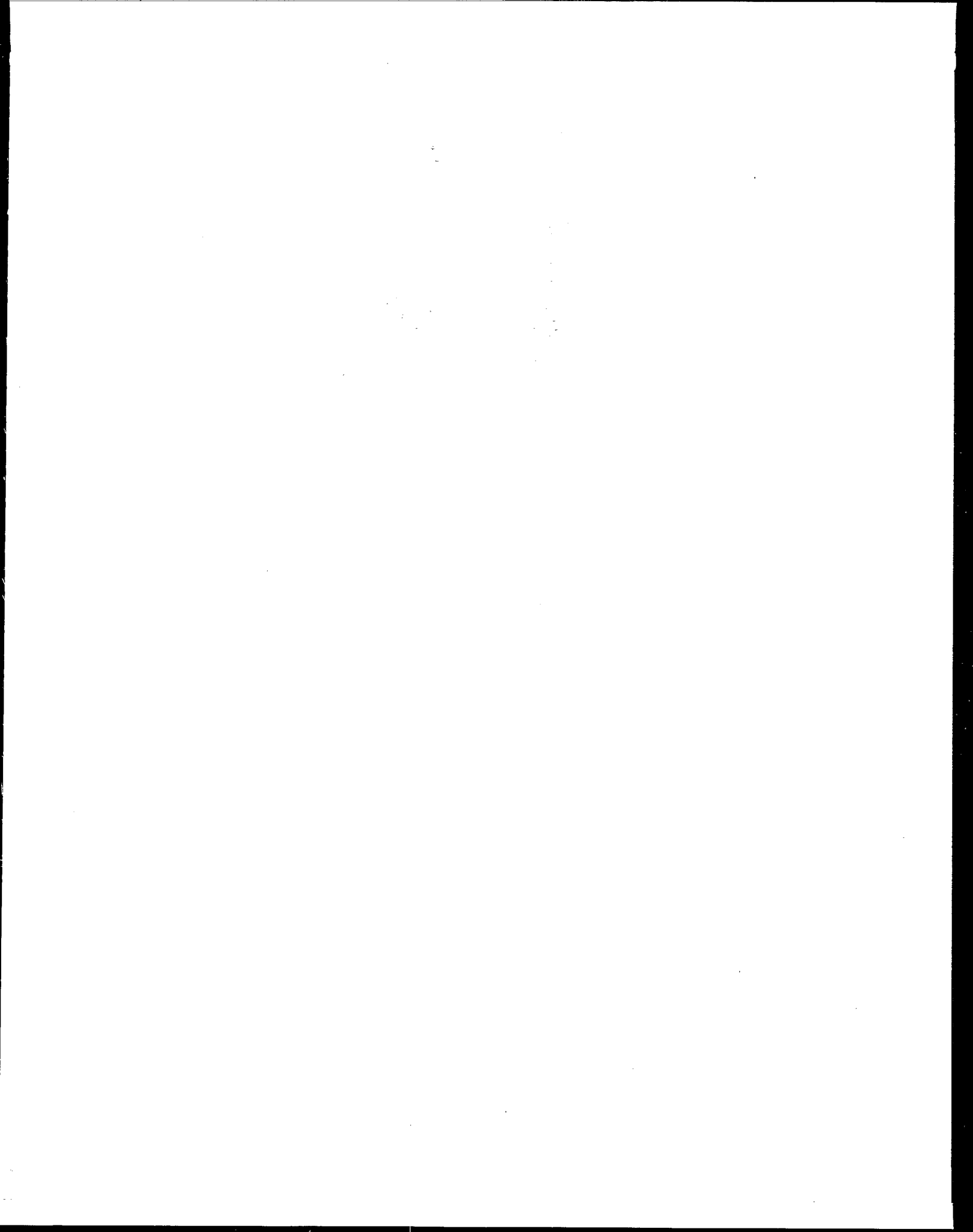
**North American Association
for Environmental Education**
410 Tarvin Road
Rock Spring, GA 30739
phone: (706) 764-2926
fax: (706) 764-2094
e-mail: beager410@aol.com
web site: www.naaee.org

ON THE COVER:

BACKGROUND:
Clay County High School students install
a bridge along the campus nature trail
they designed and built (see page 4).

TOP AND MIDDLE:
Gove Elementary School students
at Pine Jog Environmental Education
Center (see page 7).

BOTTOM:
Teachers learn to use the *Environmental
Education Materials: Guidelines for
Excellence* at the annual NAAEE
conference (see page 48).
Photo: Jeff Bach, Atlanta